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DEMERARA.

BY F. M. ENDLICH.

THAT northern portion of South America, known as Guyana, Gyana or Guiana, has been, in the course of time, separated into several provinces, one of which fell to Great Britain. British Guiana, or Demerara, was ceded to the Crown by Holland in 1814, and since then has been one of England's important colonies. Located within the equatorial zone, the country affords no inducements for extensive white settlement; only those who are accustomed to such climate can be employed in the prosecution of various industries and enterprises. European civilization and energy have wrested from the fertile soil golden fruits, and the flourishing colony has seen a long period of uninterrupted prosperity.

While the country bordering upon the sea is low and flat, it becomes more broken and even mountainous towards the interior. Complete explorations of the southerly portions of the colony have not been made as yet, and, in consequence, strange legends and rumors are afloat concerning the hidden mysteries and well-guarded treasures of the *terra incognita*. Gold is reported to have been found at various places, sometimes as nuggets and again imbedded in the rock. Traditions of unsurpassed mountain scenery, the Alps and the equator combined, tempt the spirit of venturesome travelers. Within accessible distance, the Kaiteur falls, renowned for their picturesqueness, have received the homage due them, at the hands of those who braved alike climate and fatigue to enjoy their refreshing thunder.

Dense, tangled "bush," the frequency of swamps and marshes,

both abounding in creatures of decidedly anti-domestic tendencies, render exploration difficult, and turn even a so-called pleasure trip into arduous labor. So far as plantations and isolated settlements extend, transportation is a matter of no difficulty, even steam being employed for the convenience of passengers and freight. Beyond these limits, however, only great endurance and immunity from climatal influences, will enable the stranger to satisfy his thirst for knowledge of a region but little known to the civilized world.

Almost involuntarily the comparison obtrudes itself between exploration in arctic and tropical regions. On the one hand a temperature which would seem to congeal every impulse, benumb every physical and mental capacity; on the other, a degree of heat which renders alike exercise and rest a matter of positive danger, and produces conditions of mental indolence and apathy similar to the first. Passing over rugged, broken fields of ice and snow, where every individual force is brought into requisition, may be compared to the struggle through densely matted forests, through treacherous marshes,

> "Where at each step the stranger fears to wake
> The rattling terrors of the vengeful snake."

Unequal, however, would seem the reward. While atmospheric phenomena alone beautify the field of the arctic explorer, while to him the midnight sun is but a weird shadow of the day he longs for, and while the fitful gleams of an aurora bring to mind the indestructible forces of nature, every step in the tropical country, unless it be a desert, calls forth admiration and wonder at the vigor and fullness of animal and vegetable life. Forms of the most profound interest rise up before him, forms of which he finds but the stony record of bygone eras in his own country. The marvelous vitality of plant life, too, affords him a glimpse into the sealed book of geological age, where time appears to be annihilated.

Approaching by sea from the northward, a dark line along the horizon denotes the presence of land. As the water is shallow in the vicinity of the coast, all ships of heavy draught are obliged to wait for high tide before entering the harbor of Georgetown, Demerara's capital. A chapter on the gradual accretion of land, and on the hydrographic conditions of the northern coast of South America, would here be out of place, so it may suffice to remark

that the coastline of British Guiana is subject to serious changes in consequence of marine currents, unless such changes be anticipated and avoided by artificial means. In order to protect plantations and settlements of the lowlands, the Dutch Government caused an extensive "sea-wall" to be built. The experience gained by them in their native country was here successfully applied, and the profits accruing from this tremendous undertaking have shown the wisdom of its inception. Repairs to this means of defense require annually large sums, which are borne by estate owners and the British Government, in order to secure cultivation and returns from lands which otherwise would be submerged at high tide.

Georgetown is certainly a most beautiful place. As the center of enterprise, from which is directed the utilization of resources afforded by the colony, it has a busy appearance. Immediately beyond the business quarters of the town, however, are the delightful habitations and luxuriant gardens of its citizens. A welcome sight is that of the Stars and Stripes, floating over the residence of our consular representative, Col. Figyelmesy; his courteous thoughtfulness and hearty reception will ever render the visit to his tropical home a most grateful memory.

The construction of houses, which permits free circulation of air, is thoroughly well adapted to the exigencies of the climate. A sea-breeze keeps the air in motion and makes life very endurable. No pen can do justice to the brilliancy of the tastefully arranged gardens by which nearly every house is surrounded. Magnificent flowering trees, and shrubs exhaling fragrant perfumes, are cultivated in abundance. Hospitality is a leading feature of the citizens, and the stranger finds every opportunity offered him for admiring their sense of the beautiful.

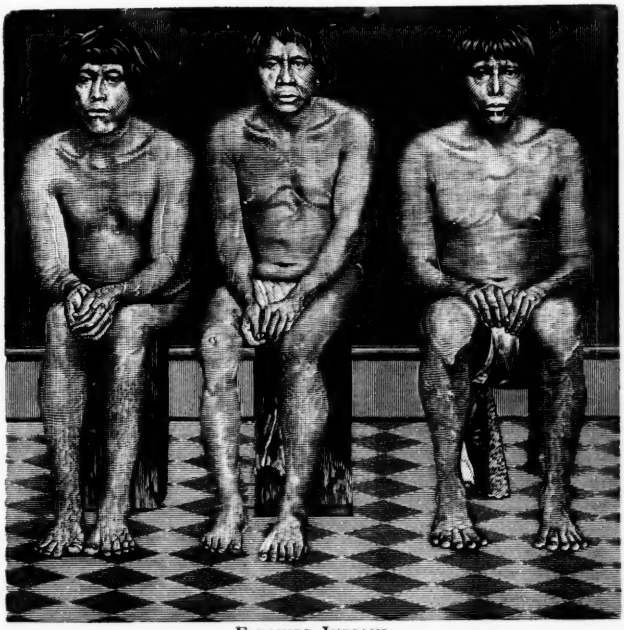
In our northern climes, where nearly one-half of the year seems devoted to the apparent dying and death of all plant life, we are driven to bestow an adequate portion of our affections upon more unchangeable objects. Thus it is hardly surprising that blue-colored plates, hideous ornaments of days gone by, and chairs, quaint to look at, but also quaint to sit upon, claims so much of our attention. When climatal changes interrupt the enjoyment of nature's exhibits, it seems necessary to find other subjects upon which the superfluous sentimentality demanded by reigning fashion can be expended.

It would require the eyes of Argus to take in all the floral beauty, and at the same time do justice to the picturesque appearance of the streets. Famous for its arrangement and the care bestowed upon it, is the public garden of Georgetown, and it can readily be imagined how flourishing any undertaking of this kind must be, in a climate so propitious to the highest and most speedy development of vegetable life.

While the commerce of the colony is largely in the hands of Englishmen, a goodly number of Portuguese have acquired prominence in the mechanical and domestic arts. Negroes, Indians, Chinese and East Indians, all of them, more or less—generally less—fantastically attired, mingle with the bright colored uniforms of British soldiery. On market days, the scene is one of great interest. Large trees shelter the space devoted to this purpose, and beneath them, may be seen stretched the dusky forms of Africans, Americans and Asiatics, in peaceful contemplation. Groups of chattering coolies, of more silent Indians, and of exhilarated darkies are scattered everywhere. Shouts and cries, partly of recognition, partly to attract customers, are heard on every side. Fruits and other produce, as well as articles prepared by the skillful hands of natives, are exposed for sale.

Passing along we may meet a bronze-colored girl, clad in a short petticoat, boddice and breast cloth of flaring hues, gold and silver armlets, wristbands and anklets, which worn in profusion, show a pleasing contrast to the soft, dusky skin. Hair, black as jet, falls from under a head-gear composed of a single cloth, which is draped with inimitable grace and ornamented with gold and silver spangles and rings. Dark, piercing eyes are deeply set beneath finely developed eyebrows. The flattened, somewhat broad nose is supplied with a curiously fashioned button, fastened into its side. Earrings of liberal proportions and sometimes elaborate workmanship adorn the members for which they are intended. Small hands and feet denote purity of race, and the girl proves to be one of the imported East Indian coolies. Her entire wealth consists in the trinkets with which she bedecks her person, and the consciousness of her superior charms is visible in every movement. From a dark olive tint, the color of these coolies varies to almost black, particularly among the males. Of medium height, thin, but very muscular, their bodies and limbs exposed by a minimum of clothing, these people present a striking type, adding

PLATE I.



ESEQUIBO INDIANS.

greatly to the fantastic character of the scene. Upon occasions of more elaborate toilet, they drape themselves in a burnous-like cloak of white or striped material, and wear turbans. Long staffs of Yakka-wood, hard and tough, serve manifold purposes. They assist in the carrying of burdens and give employment to hands and arms. It is stated that during one of the more recent insurrections the laborers did terrible execution with these Yakka sticks.

The native Indians have adapted their costumes to the requirements of the climate. While selling their produce, they walk the streets in a costume that would create consternation in the drawing-room. Negroes have found the place allotted to them throughout the world, although a few have shown an enterprising spirit, and consequently have risen in wealth and importance.

Chinamen follow the calling which elsewhere serves to make them conspicuous. Their intimate relation to soap and washboards proves them to be a very useful factor in social economy, wherever they go. At Georgetown, a special quarter is assigned to them, and they live as though sheltered by their own native country. Stores, kept by Chinamen, supply them with food and utensils from the celestial empire, and they worship their own particular deities with the same regularity and observances as at home. Frugal habits and the never-dying desire to spend the last days of their lives in the land of their ancestors, impel them to labor earnestly for the pittance, which, for their wants, constitutes a fortune. As workmen on sugar estates they are highly prized. Their sagacity and industry make them indispensable to their owners.

Leaving Georgetown by rail, the route lies through low marshy country; a large portion of this would be flooded at high tide were it not for the protecting sea-wall. Advantage has been taken of this fact, and narrow canals, connected with the bay, supply the place of roads on plantations. The first glance discloses the main staple of the colony, sugar-cane. Extensive works are visible in many directions, and immense fields are covered with the growing cane. Demerara sugar production has kept pace with the improvements devoted to the industry. Visiting an estate of perhaps several thousand acres, the traveler finds himself within a small, well regulated commonwealth.

Coolies, negroes and Chinamen, perform the labor. Dozens of working-men and women may be seen cutting the cane, and transferring it to iron punts on the small canals. By way of the latter, the sugar-house is reached and the extraction of cane-juice begins. Machinery of ponderous dimensions, is employed to crush the cane, and the juice resulting therefrom undergoes the usual process of boiling. Evaporation of moisture at the right time is an important item in the manufacture of sugar, and much ingenuity as well as money has been expended in producing the most satisfactory appliances for this purpose. Without entering into details it may be stated that the sugars of Demerara are prepared under exceptionally favorable auspices. Excellent workmen, carefully trained by their superiors, the supervision of expert chemists, and the deep interest taken by all in the production of this staple, ensure an article which need rank second to none.

The interior of a sugar-house shows a motley assemblage: negroes and coolies chanting their monotonous song, attend to the feeding of the crusher. Dark figures almost naked, flit through the clouds of steam rising from the boiling pans. What with the noise from machinery, the weird half-light and the impish looking creatures stirring the boiling masses, a vision of the *Inferno* is readily suggested.

For this colonial industry the influx of East Indian coolies has proved a blessing. The matter has received due attention from the British Government, and the immigration of these people, as well as their subsequent stay is admirably managed. Estate owners are obliged to provide them with suitable habitations and the necessaries of life, besides paying stipulated wages. Hospitals are established on the premises, and resident physicians have charge of patients. In every way the workmen and their families are satisfactorily cared for. Often they even prefer to remain after the five years of their contracted time have expired. Should any occasion for complaint arise, there is at hand a special bureau created for this purpose, and causes of abuse are removed with rigorous justice. Upon departure from the scene of his servitude the coolie has guaranteed to him the passage to his own home, and the few hundreds of dollars which he has saved by economizing, enable him to live in comparative comfort and ease among his countrymen.

A coolie village is an attractive sight. Trim huts, placed within

small gardens, stand in rows along the road. Numerous children, often elaborately clad in only a bead necklace, play around the street and garden. Old men and women seek the shade and enjoy their smoke, while the younger ones are at work in the fields or in the sugar-house. Certain clans seem to band together, indicating their character by hanging out a flag, and to all appearances the people are happy. On gala-days, or when a visit is made to the town, all available ornaments are brought into requisition for personal adornment, and great is the pride of their wearers.

Beyond the estates are found tracts of "bush." Difficult of access on account of intervening swamps, these remnants of original forest present an almost impenetrable front. Densely intertwined plants, one clinging to the other in emulation of the traditional ivy and oak, form an effective barrier, and nothing but a long *machete* will be of any avail in traversing

"Those matted woods, where birds begin to sing."

Occasional swampy clearings harbor flocks of white herons and other birds.

Living along the Esequibo river and its tributaries, we encounter the native Indians (Plate I). They are separated into tribes, bearing similar relations to each other as of our own Indians. Here they follow hunting and fishing, basket making, the production of pottery and netting of grass hammocks. For shelter they build rude huts, generally protected on one side by trees and other growing plants, while three sides are open. Thatched palm leaves form the roof, which protects the inmates from heavy dews and periodical rains. Hammocks of twisted grass are swung between the poles which support the roof, and serve as resting places by day and night (Plate II). An Indian nature requires much rest. These hammocks have acquired a well merited reputation and are prized on account of their lightness and durability. Physically the Indians present a strong, healthy appearance. They are of medium height, well knit, muscular, and rarely show any superfluous tissue. Thick black hair covers their heads and protects them from the rays of a tropical sun. Sometimes this is worn long, falling over the shoulders. Square, massive features characterize the face, which would have a stupid expression were it not for the bright, black eyes. The men wear few or no ornaments, and usually no clothing except a loin-cloth. Generally the women

are well developed, muscular, and appear more agile than the men. Both are able to endure great bodily hardships. Necklaces made of beads, teeth, feathers, the lustrous wings of bugs and other materials of personal decoration in use among savages, are the never-failing adornments of these squaws, although all other wearing apparel may be dispensed with. Short aprons, worked in attractive patterns and trimmed with beads and feathers, are worn. Long tassels, interwoven with fur, feathers and grass are attached thereto. Anklets, either of metal or plaited grasses are almost invariably used, and appear to answer, in some way, the purpose of protecting and strengthening the lower portion of the leg (Plate III). The female Indian is not beautiful, far from it, but in appearance she compares favorably with our North American squaw. As usual the women perform the greater portion of the manual labor, although the "lords of creation" will sometimes condescend to assist. Hunting, fishing, the search for valuable timber or medicinal plants, with an ample allowance of peaceful repose, fully occupy the man's time. Rum, obtained at a ridiculously low price, furnishes restful oblivion and freedom from care. This, together with tobacco, serves to smooth the native's path and gently hurry him along on his journey through mundane scenes.

Spears and arrows are used in fishing. Generally the spear-heads are three-pronged and sharply barbed, but for smaller fish one prong suffices. Often these are made of a poisonous wood, which is said to paralyze the motions of the animal, so that it may easily be taken. Long arrows with iron points are shot into the fish, which then are speedily secured. Fishing, by hook and line, or net, provides a large portion of the Indians with bodily sustenance. Quadrupeds, birds and snakes are likewise hunted with spear and arrow. The former is a sort of javelin with poisoned tips. For long distances a bow is used measuring nearly seven feet in length, arrows in proportion. Beautiful workmanship and taste in decoration make these weapons very conspicuous. Bird-arrows and those destined for larger game are prepared with special reference to the distances of their flight and the animals they are aimed at. For hunting in the bush a short bow, about three or four feet long, is employed. An ingenious contrivance saves the hunter from losing his arrows in case the game be only wounded; at the same time it enables him to do a great deal of execution with only a small supply of weapons. For this pur-

PLATE III.

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pose the point-end of the arrow is made blunt, and a narrow longitudinal slit cut into one side. The end is tightly wound with cord made of wood fiber. A number of points about the size of matches are cut from the siliceous rind of reeds and are prepared with ourare. Inserting one of these points into the slit, it is held there firmly enough to enter the body of an animal, while the arrow drops off and can be recovered.

Ourare is a very important factor in the hunting equipment of Guiana Indians. It is prepared by them from a variety of poisonous woods, barks and fruits, is placed in small calabashes and carefully wrapped in leaves. When required for use, cassava juice is employed to soften it. The deadly effect of this poison is too well known to require further mention. Inasmuch as it is used not only for purposes of the chase, but also in warfare, the Indians have recourse to what they claim as an effective antidote. In appearance this is a black powder, resembling charcoal. Any person desiring to make himself ourare proof, inoculates himself at several places of his body. By taking this precaution he is supposed to be insured against the deadly action of the poison for a number of years. In case no previous inoculation has taken place, an immediate introduction of this substance into the blood is said to neutralize the effect of ourare.[1]

Apart from the more warlike propensities of the chase, the Guiana Indians are no strangers to the soothing influences; they have invented flutes to beguile the hours when not resting. Two kinds are especially noticeable, the one made of reeds, the other of suitable bones. Of the latter the leopard furnishes the most frequent specimens. Whether it is merely a matter of preference or whether the possession of such a flute recalls reminiscences of successful encounters, cannot be told. Limited as to scope and volume, yet the sounds produced by these instruments, ornamented as they are with bright feathers and tassels, show that

"* * * music for the time doth change his nature."

In their domestic relations the Demerara Indians resemble their North American brethren. Contact with the whites has had the same influence upon them. Living in a zone where clothing can be dispensed with, where the sustenance of life is rendered easy by

[1] I have been assured by a gentleman that this was a fact, he having seen the experiment of ourare poisoning and the administering of the antidote, successfully performed upon dogs.

the bountiful provision of nature, they have but few wants. Rum, beads, and trinkets comprise their ambition. In exchange for these they furnish rude pottery, handsomely wrought baskets and the hammocks above mentioned. Farther towards the interior these people have hardly been disturbed as yet, and live on without being affected by extraneous influences. Their haunts are difficult of access, and it is but rarely that any venturesome traveler penetrates to their homes.

Traveling by water is perhaps the most available method, but even then many obstacles confront the explorer. It is owing to these facts that comparatively little is known of the Guiana Indians, and it may be a long time before complete information can be obtained regarding their distribution, manners and customs. A praiseworthy spirit has been shown at Georgetown, by the establishment of a Colonial Museum, where archæological specimens and products of the present day are carefully preserved. The great interest taken at this time in matters pertaining to ethnology and anthropology has pervaded all countries and all classes, so that we may hope ere long to see the correlations of races and tribes, now obscure, more fully established.

The tropical flora and tropical fauna are too well known to require any special mention. The rich, strong colors, the evidence of exuberant life and the unaccustomed forms exhibited by the vegetation must make a profound impression upon the stranger from northern climes. Where every step, every turn reveals so much that elicits sympathetic response, it is natural that the admiration of nature's most lovely products should become an integral part of the appreciative mind.

Demerara has made great strides in development during the past few decades. Sanitary measures, well adapted regulations as to non-European inhabitants, and good government have brought the colony to a condition of flourishing welfare. The comforts of home-life have been combined with the advantages of tropical residence, and few places, indeed, may be visited, which will so amply repay the trouble. Staples for which there is constant demand are the basis of colonial wealth, and the enterprise heretofore shown by planters and manufacturers, gives assurance that in its own productions Demerara will never be found lagging behind its competitors.

A SKETCH OF THE PROGRESS OF BOTANY IN THE UNITED STATES IN 1880.

BY PROFESSOR C. E. BESSEY.

A. Anatomy and Physiology. — A valuable paper appeared in the *Botanical Gazette* for November, on "The Stem of the Pumpkin for illustrating Plant Histology," by J. C. Arthur. The disposition of the various tissues, with notes upon some of their peculiarities, and suggestions as to the best methods of preparing them for observation, make up the bulk of the paper. Finally a classified list of the tissues is given, as follows:

Epidermal System:
- Epidermis.
- Stomata.
- Hairs.

Fundamental System:
- Interfascicular parenchyma.
- Hypoderma;
  - Cortical wood.
  - Cortical parenchyma.
  - Collenchyma.

Fibro-vascular System:
- (Cambium.)
- Phloëm;
  - Sieve-tubes.
  - Phloëm parenchyma.
- Xylem;
  - Vessels;
    - Annular.
    - Spiral.
    - Reticulated.
    - Scalariform.
    - Pitted.
  - Wood parenchyma.

"To these should doubtless be added Laticiferous tissue, sometimes detected in the phloëm."

W. K. Higley, in two papers published in the NATURALIST for Oct. and Nov., added somewhat to our knowledge of the "Microscopic Crystals contained in Plants." Many crystal-containing plants are noted, and a useful list is given of all the natural orders of plants in which these structures have been observed.

Dr. Engelmann's paper on "The Acorns and their Germination," published in the Transactions of the St. Louis Academy of Sciences, Vol. IV, records the results of his careful study of the germination of the acorns of many species. In addition to a definite statement of the structure of the embryo in the species examined, the author describes the tuber-like enlargement of the radicle in the live-oak, caused by the transfer to the latter of the food from the cotyledons.

In a paper on "The Supposed Dimorphism of *Lithospermum longiflorum*," by C. E. Bessey, published in the June number of the NATURALIST, the writer showed by means of many measurements that this species is not dimorphic (heterostylous), but that

its large flowers are exceedingly variable as to length of corolla and style.

Thomas Meehan's "Dimorphic Flowers in Houstonia" and "Cleistogamy in *Oxalis acetosella*," and I. C. Martindale's "Sexual Variation in *Castanea Americana*," published in the Proceedings of the Academy of Natural Sciences of Philadelphia, should be noted here as interesting contributions to this department of botany. The "Notes on the Flowering of *Saxifraga sarmentosa*," by Professor J. E. Todd, in the August NATURALIST, are somewhat more extended than the preceding, and accompanied by several wood-cuts.

"Nectar and its Uses," published by Wm. Trelease in the Report upon Cotton Insects, issued by the Department of Agriculture, is a carefully prepared essay, bringing together what is known as to the production and uses of the nectar of plants. A plate and an excellent list of the books and papers treating of nectar, add to the usefulness of the essay.

Professor W. J. Beal published in the March number of the NATURALIST, some notes on the "Agency of Insects in Fertilization." These notes were made by students under the guidance of the professor, and many of them are admirable.

Wm. Barbeck, in the Proceedings of the Academy of Natural Sciences of Philadelphia, published a paper on "The Development of Lemna," in which he concludes that in Lemna "we have an interesting instance of parthenogenesis, there being seeds (produced in autumn by a sexual process) from which, during the course of the summer, generation after generation is propagated without any further fertilization."

Here should be mentioned Dr. Gray's note on the "Automatic Movement of the Frond of *Asplenium trichomanes*," published in the *Botanical Gazette* for March, and W. K. Higley's notes on "Carnivorous Plants" *(Drosera rotundifolia)* in the December number of the same journal.

B. Systematic Botany.—a. Fungi. In the March number of the *Botanical Gazette*, C. H. Peck described nineteen new species of fungi, mostly from the Eastern United States. These are an interesting Stemonitis *(S. Morgani)* which is closely related to *S. fusca; Coniothyrium minutulum, Leptothyrium chromospermum, Phoma albistrata, Phoma colorata, Septoria consocia, Septoria irregulare, Discella variabilis, Sporidesmium minutissimum, Lecythea*

macrosora, *Æcidium Jamesianum*, *Sorosporium atrum* on a Carex, from Pennsylvania and Colorado, *Cheiromyces tinctus*, *Peziza spongiosa*, *Phacidium sparsum*, *Stictis fulva*, *Diatrype angulare*, *Sphæria altipeta*, *Sphæria lichenalis*.

Twenty-nine new species of fungi, collected in California by Dr. Harkness, were described by M. C. Cooke in the September number of *Grevillea*. The descriptions are mere Latin diagnoses, and are by no means satisfactory. The species described are *Phoma hosackiæ*, *Chætophoma atriella*, *Vermicularia subglabra*, *Septoria helianthicola*, *Discella olivacea*, *D. tenuispora*, *Diplodia microscopica*, *D. rhuina*, *Hendersonia galiorum*, *Dichomera phaceliæ*, *D. compositarum*, *Glæosporium leguminis*, *Torula glutinosa*, *Coleosporium baccharidis*, *Macrosporum culmorum*, *Trichaëgum atrum* Preuss., *T. opacum*, *Fusarium gallinaceum*, *Leotia ochroleuca*, *Stictis decipiens* Karst., *S. radiata*, var. *pumila*, *S. annulata* C. and Phil., *Ascomyces fulgens*, *Sphæria labiatarum*, *S. epipteridis*, *Sphærella brachytheca*, *S. araliæ*, *S. dendromeconis*, *S. acaciæ*. All, with three exceptions indicated above, are described as by Cooke and Harkness, who are therefore to be quoted as the joint authors of the specific names.

M. C. Cooke enumerated thirty-one species of "New York Fungi," of which seven were new, in the March number of *Grevillea*. The new species which are described are the following: *Coniothyrium rubellum*, *Diplodia celastri*, *D. compressa*, *Massaria Gerardi*, *Psilosphæria melasperma*, *Conisphæria peniophora*, *Sphærella ilicella*.

Two new species of Septoria were described by Baron F. De Theumen in the October *Botanical Gazette*, one *(S. Albaniensis)* on Salix from New York, and the other *(S. Querceti)* on Quercus from South Carolina.

An interesting addition to the Phalloidei was made in an article on "A New Fungus," by W. R. Gerard, in the January *Bulletin of the Torrey Botanical Club*. The new species, *Simblum rubescens*, was discovered on Long Island. A full and satisfactory description is given, and two good plates are added. Appended to the paper is a valuable "List of United States Phalloidei," including all "which have been detected in the United States up to the present time."

The "Catalogue of Pacific Coast Fungi," by Dr. Harkness and J. P. Moore, first read before the California Academy of Sciences,

Feb. 2, 1880, and afterwards published in a pamphlet of forty-six pages, enumerates nearly 900 species. Localities and habitat are given for the greater number of the species. One new species, *Agaricus tridens* Moore, from a drift 400 feet below the surface, is described.

A valuable article on "The White-grub Fungus," appeared in the June number of the *American Entomologist.* The writer (C. V. Riley) appended a list of papers containing references (mostly popular) to this fungus. Two wood-cuts accompany the article.

Professor Prentiss' paper in the August and September NATURALIST, on the "Destruction of Obnoxious Insects by means of Fungoid Growths," recorded the results of a series of experiments with yeast as an insecticide. The results were plainly adverse.

Professor Burrill's paper on "Anthrax of Fruit-trees," read before the Boston meeting of the American Association for the Advancement of Science, did not reach the public, through the tardy publication of the "Proceedings," until about a year later. Abstracts appeared in various journals, one of which, viz., that in the *American Monthly Microscopical Journal,* is selected for notice here. The disease called blight is held, by Professor Burrill, to be due to "a living organism which produces butyric fermentation of the material stored in the cells, especially those in the liber. This organism is allied to, if not identical with the butyric vibrione of Pasteur, and the *Bacillus amylobacter* of Van Tieghem." Experiments were made by inoculating healthy trees, and the results appeared to sustain the theory of the bacterial nature of the disease. The bacteria observed were described, and careful measurements given.

Century IV of Ellis' now well-known "North American Fungi," was issued during the year.

b. Algæ. Francis Wolle's paper on "Fresh-water Algæ," in the April *Bulletin of the Torrey Botanical Club,* contained a "list of upwards of one hundred plants, at least ninety of which are new to the United States, and of which eighteen were wholly unknown." The new species described are the following: *Sphærozyga saccata, Tolypothrix bombycina, Euastrum Donnelli, E. formosum, Micrasterias Kitchelli, Staurastrum pulchrum, St. Nova-Cæsareæ, St. tricornutum, St. macrocerum, St. fasciculoides, St. subarcuatum, St. comptum, St. pusillum, Arthrodesmus fragilis, Pleurocarpus tenuis, Œlogonium Donnelli.* In the August num-

ber of the same journal the same author publishes a plate containing good figures of all the new desmids in the preceding list.

Dr. Farlow's paper "On some Impurities of Drinking-water caused by Vegetable Growths," published in the First Annual Report of the Massachusetts State Board of Health, contributed to our knowledge of the economic relations of the fresh-water algæ to ourselves. Two plates accompany this valuable paper.

Dr. T. F. Allen's "Characeæ Americanæ Exsiccatæ," consisting of dried specimens of ten species of Characeæ, was issued late in the year. The species are *Nitella tenuissima* Desv., *N. intermedia* Nordst., *N. megacarpa* Allen, *Chara intermedia* A. Br., *Ch. intermedia* A. Br., var. *Americana* A. Br., *Ch. contraria* A. Br., *Ch. sejuncta*, A. Br., *Ch. coronata* A. Br., var. *Schweinitzii* A. Br., *Ch. gymnopus* A. Br., var. *Michauxii* A. Br., *Ch. hydropitys* A. Br., var. *septentrionalis*, Nordst.

c. Lichenes. Our lichenologists appear to have published nothing during the year.

d. Bryophytes. A severely critical paper entitled "Bryological Notes and Criticisms," by the lamented Coe F. Austin, appeared in the January *Bulletin of the Torrey Botanical Club.* It was suggested by the study of a paper by Lesquereux, James and Schimper containing descriptions of new species of North American Mosses. Mr. Austin challenged many of the new species described in the paper under review.

Mr. Austin published a paper, Bryological Notes, in the February number of the *Bulletin*, consisting of critical notes upon several species of mosses and several descriptions. The new genera Donnellia and Rauia were announced (but not described) and descriptions were given of *Donnellia Floridana* and *Thuidium Alleni.*

The "Catalogue of North American Musci," by E. A. Rau and A. B. Hervey, enumerates 1237 species. Localities are given for all the species.

e. Pteridophytes. Professor D. C. Eaton's magnificent work, "The Ferns of North America," was brought to a close early in the year. The beautiful plates, by Emerton and Faxon, and the clear and satisfactory descriptions are notable features in this great contribution to our knowledge of the ferns of this country.

In the June *Bulletin of the Torrey Botanical Club*, Professor Eaton, under the title of "New or Little-known Ferns of the United

States," notices several species, and describes one new one, *Notholæna Lemmoni*, from Arizona. The same author's "Systematic Fern List," a twelve page pamphlet, appeared in September. It consists of "a classified list of the known ferns of the United States of America, with the geographical range of the species." One hundred and fifty-one species and sixteen varieties are included.

In "A New Fern," by G. E. Davenport, in the *Bulletin of the Torrey Botanical Club*, the author describes a new species *(Notholæna Grayi)* from Southeastern Arizona. A fine plate by Faxon accompanies the paper.

f. Phanerogams. Dr. Gray's "Contributions to North American Botany," published in the Proceedings of the American Academy of Arts and Sciences, Vol. XVI, is principally devoted to "Notes on some Compositæ." Synopses of species are given for the genera Aphanostephus, Chætopappa, Townsendia and Erigeron, and important notes are included under Vernonia, Solidago and Aster. Two new genera, Greenella and Grundlachia, and a number of species are described. Six new species of Asclepias are noted, and a new genus (Geniostemon) with two species of Gentianaceæ are described. Descriptions of miscellaneous species, and of a new genus of Euphorbiaceæ (Reverchonia) complete this valuable contribution.

Dr. Gray also published a synopsis of the species of the genus Leavenworthia, in the March *Botanical Gazette*.

A most important paper from Dr. Geo. Engelmann, entitled a "Revision of the genus Pinus, and Description of *Pinus Elliottii*," was published in the Transactions of the Academy of Sciences of St. Louis, Vol. IV. The characters of pines are carefully described *in extenso*, and upon these a new arrangement of the species is proposed. The characters of the fruit scale serve to separate the genus into two sections, viz: I. Strobus ("Apophysis with a marginal unarmed umbo, generally thinner"), and II. Pinaster ("Apophysis with a dorsal umbo, mostly armed, generally thicker"). "The subsections are distinguished by the position of the ducts within the leaf." The description of *Pinus Elliottii*, a south-eastern species, is all that could be desired, and this is supplemented by three large and most excellent plates.

In the January *Botanical Gazette*, Dr. Engelmann described, in full, the northern Catalpa, *Catalpa speciosa*, which had previously been considered to be *C. bignonicides*.

Several new species of the genus Potamogeton were described by Thomas Morong, in the May *Botanical Gazette.* The new species are *P. Illinoensis*, *P. Mysticus*, *P. lateralis*, and *P. gemmiparus* (the latter by Robbins). Notes are added upon several other species.

I. C. Martindale, in a pamphlet entitled "Notes on the Bartram Oak, *Quercus heterophylla* Michx." reviewed the whole history of this much discussed and doubted species, and concluded that it should be restored as a true species.

Professor Sargent's "Preliminary Catalogue of the Forest Trees of North America," contained 342 species, with notes as to size, range, economic uses, etc.

Mention should be made here of H. W. Patterson's "Check List of N. A. Gamopetalæ after Compositæ," designed for use in making exchanges, marking desiderata, etc.

Robinson's "Flora of Essex county, Massachusetts," Smith and Mohr's "Preliminary List of the Plants growing without cultivation in Alabama," Peck's "Plants of the Summit of Mt. Marcy" (from the 7th Rept. of the Adirondack Survey), the list of "Ballast Plants in and near New York city," by Addison Brown, in the December *Bulletin of the Torrey Botanical Club*, are valuable additions to our knowledge of local floras. Here may be noted the beginning, in the last named journal, of an important List of the State and local floras of the United States, by W. R. Gerard and N. L. Britton.

C. Geographical and Geological.—Dr. T. F. Allen, in a paper entitled "Similarity between the Characeæ of America and Asia," in the *Bulletin of the Torrey Botanical Club*, pointed out the resemblance between the Asiatic and American Characeæ. "A Summer in Roan mountain," by J. W. Chickering in the December *Botanical Gazette;* "A Botanist in Southern California," by J. F. James, in the July NATURALIST; "Botanizing on the Colorado desert," by E. L. Greene, in the November NATURALIST; "The Timber Line of High Mountains," by Thomas Meehan, in the Proceedings of the Academy of Natural Sciences of Philadelphia, and "The Geological History of the North American Flora," by Professor Newbury, in the July *Bulletin of the Torrey Botanical Club* (abstract of a lecture) are the other important contributions under this section.

D. Historical.—The conclusion of Frederick Brendel's "His-

torical Sketch of the Science of Botany in North America, from 1840 to 1858," in the January NATURALIST, and the "Sketch of the Progress of Botany in the United States in the year 1879," by C. E. Bessey, in the December NATURALIST, are the only historical papers published during the year.

E. Text Books, etc. — Dr. Killebrew's little book "Grasses, Meadows and Pastures," and Dr. Sturtevant's pamphlet on "Indian Corn" (reprinted from the 38th Rept. of the N. Y. State Agricultural Society) deserve mention here on account of their botanical interest, in addition to their high agricultural value.

"Botany for High Schools and Colleges," Holt & Co., N. Y., by C. E. Bessey, appeared early in August. It consists of two hundred pages of general anatomy and physiology of plants, followed by three hundred and seventy-five pages devoted to the special anatomy and physiology of plants, and outlines of their classification. Under the first, protoplasm, the plant-cell, cell-wall, formation of new cells, products of the cell, tissues, tissue systems, intercellular spaces, plant-body, chemical constituents of plants, chemical processes in the plant, relations of plants to external agents, are successively discussed. In the second part the characters of the seven grand divisions (sub-kingdoms) of the vegetable kingdom are described; the limits of the classes, cohorts and orders are briefly outlined, and their structure illustrated by selected examples.

A second revised and enlarged edition of Volney Rattan's "Popular California Flora," was issued about the middle of the year from the publishing house of Bancroft & Co., San Francisco. As enlarged, it consists of a hundred and fifty-six pages, including twenty-four pages of introductory matter, followed by simple descriptions of the less difficult plants selected from the flora of West-central California.

By far the most important botanical book of the year, was Sereno Watson's Vol. II of the "Botany of California," including Apetalæ, Gymnospermæ, Monocotyledones, Vascular Cryptogams, Musci and Sphagnaceæ. Dr. Engelmann elaborated the oaks, the pines and their allies, and the Loranthaceæ; M. S. Bebb, the willows; Wm. Boott, the Carices; Dr. Thurbur, the grasses, and Professor Eaton, the vascular cryptogams. A valuable "List of Persons who have made Botanical Collections in California," is appended, by Professor Brewer. The two volumes of this now

completed work, aggregating nearly twelve hundred pages, stand as a most pleasing monument to the ability of the authors on the one hand, and on the other to the generosity of the business men of California, who voluntarily defrayed all the expenses of preparation and publication.

F. Periodical Publications.—The *Bulletin of the Torrey Botanical Club* and the *Botanical Gazette* continued throughout the year as our only exclusively botanical journals. Each gave good evidence of substantial growth. The botanical departments of the *American Journal of Science* and the NATURALIST were maintained as usual. Botanical articles frequently appeared also in the *Gardener's Monthly*, *American Agriculturist*, *American Monthly Microscopical Journal* and the *American Journal of Microscopy*.

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EFFECTS OF REVERSION TO THE WILD STATE IN OUR DOMESTIC ANIMALS.

BY HON. J. D. CATON.

A UNIFORMITY of form, color and habit in individuals among the various species of wild animals, is almost universally observed, and the loss of this uniformity under the influence of domestication, if less universal, is very general. How long it took to produce these changes in the horse and the ox, the sheep and the goat, we cannot know, for these were subdued to domestication before events were recorded which might tell us of the struggle. That some animals were more readily influenced by domestication than others, we know. How readily the wild turkey changes in form, color and habits under the influence of domestication I have demonstrated by my own careful experiments, an account of which I gave in the AMERICAN NATURALIST for June, 1877. That the domesticated reindeer of Lapland have become parti-colored, while their wild brethren of the mountains all about them retain a uniform color, I have shown in "The Antelope and Deer of America," p. 330, and in "A Summer in Norway," p. 223. The deer in the parks of England and Ireland have become unstable in color, although they have been subjected to the influence of domestication for a much shorter period than have the reindeer of Lapland. These are the most striking instances among the quadrumana, which occur to me, to

enable us to compare the wild with the domesticated animals, although the wild horse and the wild ass are still met with in Asia, and the wild ox still existed in Scotland till within very recent times at least, but it may be well doubted whether the wild cattle of Scotland are the progenitors of our domestic ox. The domesticated buffalo, as seen in Southern Europe and Asia, and in Northern Africa, has degenerated less in both color and form than most other quadrupeds under domestication, and his wild habit still possesses him to a certain extent.

The wild boar submits to domestication with remarkable docility, and human care changes its form, color and habit in a very short time and in a remarkable degree. Human care, by judicious selection, may fix varieties of all these domesticated animals with persistent characteristics, but immediately his supervising care is withdrawn, all these peculiarities disappear.

Of the birds, perhaps the peacock resists the influence of domestication with the most persistence, though the guinea fowl undergoes no perceptible change from generation to generation, with rare exceptions.

While all have had opportunity to observe the changes which have been wrought in our domesticated animals by human care and supervision, opportunities have not been so general for observing the effects upon our domesticated animals when allowed to return to the wild state. My observations lead me to the conclusion that the tendency is not only to return to the wild habit, but to the original form and coloring of the remote wild ancestor. That there is some law governing this reversion we may well believe, though we may not be able to fully understand it yet.

My own observations tend to show not only a tendency, at least in some species, to revert to the original form and color of the wild ancestor, but they also suggest the possibility that this tendency is the strongest in those cases where the domesticated animal has most recently been reclaimed from the wild state, or in those cases where the change produced by domestication was the most rapid.

I have had the best opportunities for studying this subject in the Hawaiian islands. With the exception of the goose and the duck, nearly all of the animals which have been introduced into those islands since their discovery, as well as those which were then held in domestication,[1] have reverted to the wild state.

[1] They had the hog and common fowl when discovered by Cook.

Among these I may mention the ox, the horse, the goat, the sheep, the hog, the dog, the cat, the turkey, the peacock and the barnyard fowl. Where I had not the opportunity of studying these personally, I spared no pains to gather the facts from the most reliable sources.

The greatest physical degeneracy was observed in the wild horse and the wild sheep. The ox was introduced by Vancouver, less than a century since, upon the island of Kauai, from California, whence it was introduced upon the other islands. At most it has been subject to the new influences scarcely three quarters of a century. During that time no appreciable change has taken place in the coloring of the ox, nor much in his form, but his habit is wild and wary, fleeing from man in alarm; and he has acquired great fleetness over the lava beds in the mountainous regions which he selects for his home. While he is terrified at the approach of man; when wounded or hard pressed he becomes bold and aggressive, and is a dangerous enemy. In some parts of the islands they have become so numerous that the scarcity of sustenance has forced them down into the lower regions, where it is feared that they may destroy the forests upon which it is supposed much of the rain-fall depends. Indeed, on the Island of Ouahu a large district of country was pointed out to me which was said to have been once a forest, and was now entirely destitute of arborcous vegetation. This change was attributed to the wild cattle. They are hunted for their hides alone.

I saw none of the wild horses or wild sheep, neither of which are numerous. I was told that the former are much more degenerated in size, form and vigor than those on our western plains, which may be attributed to the want of an abundance of food adapted to their requirements in the elevated regions which they affect, but in habit they are as wild as the cattle.

The wild sheep, which are very limited in number, and I met with few who had seen them, were small, gaunt and long-legged, with a scant and coarse pelage.

The wild goats are very numerous, especially in the mountainous regions of the eastern islands. During the afternoon which I spent viewing the wonderful sights from the rim of the great extinct crater, Haleakala, I saw two bands of wild goats within the crater. I sat ten thousand feet above the sea. The chasm before me was seven miles across and two thousand feet deep. Its

vertical walls in a few places had been partially broken down, so that bunches of grass had taken root on the shelves or steps formed in the disintegrated lava, and the goats were clambering about, leaping from shelf to shelf, seeking food. Towards evening they descended to the floor of the crater and disappeared in its eastern arm. With the naked eye they could not be identified, although one band was directly beneath me, but a good field glass revealed them very plainly. A large majority were snow white, some were parti-colored, and one appeared to be black. Their natural capacity for climbing has no doubt been improved by their reversion to the wild state. They are very wild and cautious, and difficult of approach by the hunter. They, too, are hunted for their skins.

The most marked and rapid change is produced in the hog by his emancipation from the restraints of domestication and the care of man. In a single generation he changes in form, color and habit from the staid and quiet porker to the fleet and fierce wild boar. The latter is the character as described to me by all who had been interested to make observations on the subject, of the numerous wild hogs now roaming in those islands. Col. Chas. Judd assured me that many years before a lot of hogs escaped from his ranch on the easterly side of Ouahu and went into the mountain which bordered the ranch. Among them was an imported boar. Before he could find them they had become so wild that he could not reclaim them from their mountain fastnesses. He got sight of this boar many times during several succeeding years. He was so marked that he could readily identify him. The change in form and habit were almost immediate. He soon became wild and almost as fleet as a deer. His body became thin, his back arched and his legs *appeared* to be much longer than when he escaped. Much slower was the change of color, but this finally occurred to a very appreciable extent, so that in a few years he had distinctly assumed the dark sandy shade of the wild boar. He wisely forbore to shoot him that he might study the developments which he saw going on. In the third or fourth generation the pigs showed very distinctly the sandy shade and stripes observed on the side of the young of the wild boar. From these and similar observations, I should infer that it would not take very many generations, with proper care, to completely domesticate the wild boar.

I heard of but two places where the pea fowl had gone wild. The first was at the plantation of Col. Judd, before mentioned, and the other was the plantation of Capt. McKee, on the Island of Maui, whence the birds had escaped and gone into the mountain above. No change was observed except that they had become wild, but not excessively so, and I did not learn that they had been much hunted in either case.

At what time the domestic turkey was first taken to the islands, I did not learn, but probably not very long after their discovery, or certainly soon after the arrival of the first missionary, which occurred in 1820. We may safely assume that soon after, some of them wandered away and reverted to the wild state, and now they are found, more or less abundant, in the forest regions of most of the islands. They have not yet beome as wary and difficult of approach as are the wild turkeys here. The natives trap them with some success. At Haiku I found two hens in confinement which Mr. Dickey had purchased from a native who had caught them. I studied them with great interest. They were in a large poultry house, the front of which was closed with slats. On approaching them they showed about as much alarm as our wild turkey would, similarly situated. A very decided tendency was shown to revert to the color of our wild turkey. The legs had already assumed a lightish color with a pink shade, though not so brilliant as in the wild ancestor, but quite unlike the black leg of the black tame turkey. The color of the plumage had also undergone a marked change. The ends of the tail feathers and of the tail coverts had assumed a tawny or russet shade, hardly so pronounced as in our wild turkey, but a great departure from all tame turkeys. My observations in domesticating the wild turkey show that they first degenerate in their coloring in these two points. The white bars on the wing feathers were there, but they are not always absent on the domesticated turkey.

In form, too, a change was manifest; the legs were longer and the body was longer and more erect than in the tame bird. Altogether the tendency to revert to the form, coloring and habit of their wild ancestors was very marked. I say their wild ancestors, for I think I showed satisfactorily, in a paper published in this journal for June, 1877, that the domestic turkey of this country is descended from our wild turkey.

I heard of the barnyard fowl which had gone wild in several

parts of the island, but I did not see any of them. I obtained the most satisfactory account from Mr. Emerson, a son of one of the early missionaries who was located at the north-west end of the Island of Ouahu, where the son still resides. The domestic birds escaped from his father's place at least fifty years ago, and occupy an extensive elevated or mountainous wooded country. They still nest on the ground, and are quite numerous, in spite of the depredations of the wild cats. Although he has often seen them they are the most wild and wary of any animal he had ever attempted to approach, and he was very rarely able to shoot one. At the approach of day the whole forest would be vocal with the crowing of the cock, and although secreted right among them, when daylight came not one could be seen, and all was as still as if nothing had ever disturbed the quiet of the wilderness. How they managed to disappear so quietly in the gray of the morning he could not explain, for he never heard them fly from their perches in the trees.

They had diminished appreciably in size, and had assumed a uniform buff color. Now I confess that I do not know the color of the wild bird from which our barnyard fowl, or that which was common in the States sixty years ago, is descended, but if, as I have ventured to suggest, there is a tendency, when domesticated animals revert to the wild state, to return, not only to the wild habit but to take on other peculiarities of their wild ancestors, from which they had departed under the influence of domestication, then we may infer that the original wild stock was of a buff color.

I do not know that this subject has been deemed worthy of observation by naturalists, at least I have not been so fortunate as to meet with any discussion of it, but I hope an amateur may be allowed to so far depart from precedent as to make observations in out-of-the-way directions. It may be that my inclinations have too much of a practical tendency for strictly scientific studies. I study the bones but little, for practical utilitarian features interest me more.

ON THE MICROSCOPIC AND GENERAL CHARACTERS OF THE PEACH TREE AFFECTED WITH THE "YELLOWS."

BY W. K. HIGLEY.

[*Continued.*]

METHODS OF DISSEMINATION.

I DESIRE under this head to simply discuss the views of others, and in doing this to present my own views upon the subject. First, then, I will consider the belief of some that the yellows may be transmitted from one tree to another by the agency of insects, especially the honey bee, by carrying the pollen from one flower to others. Believing, as I do, that this disease is due to a fungoid growth in the *aërial portions of the tree*, this theory appears to me very absurd, more so, perhaps, because there are no facts or experiments to support it. Consider for a moment. If this disease is due to a fungus, then it must be disseminated by the passage of the spores or living mycelia from the diseased tree to other trees, either in the immediate neighborhood, or perhaps to some distant tree if the conditions are favorable for their transportation. If this is the case, and all, I think, that have carefully considered the facts, must know that it is, why should the fruit of the fungus be concentrated in the pollen? Why is it that young orchards that have never borne become contaminated with this disease? Why is it that orchards in close relation with other orchards that are affected with the yellows do not become diseased? We cannot assume that the bees will not visit both orchards! And finally, why is it that in the same orchard with healthy trees only one or two trees catch the yellows, showing all the symptoms, and the second year only one or two, or at the greatest only a few in the immediate neighborhood become diseased? Are we to assume that the bees in their search after their food are limited and not allowed to approach only certain trees?

Perhaps this is strong language to use in the face of all that has been claimed, but until the above questions are satisfactorily answered, I shall refuse to believe that insects have anything to do with the dissemination of this disease.

In concluding the discussion upon this point I will quote from the Michigan Pomological Report for 1878. On page 255, *it*

says: "Those who believe in the propagation of the disease by the agency of insects, maintain that the disease is never manifested upon healthy stock until after the young tree casts its first blossoms, and experiments for the purpose of testing their theory will be made by enveloping the young tree with netting, in such a manner as to exclude all insects during the period of bloom." However, the disease does appear very often on trees that have not blossomed!

On page 250 of the same volume, referring to the abnormal branching, it says:

"*This growth is the only means of detecting the disease in young trees or those not bearing.*" (The italics are mine.)

In the Pomological Report for 1873, under this head, the first and second methods of dissemination given, are as follows:

1. "By the intermingling of healthy roots with those of diseased trees.
2. "By planting a healthy tree in a hole whence a diseased tree has been removed."

As I have stated before, all the roots that were examined by me, presented no abnormal appearance except the looseness of the cells; in no case were any filaments of a fungus found in the tissues, nor any spores, nor any indications that a fungus had ever been present. Those that claim that the disease is caused by a root fungus, have never, to my knowledge, found any species of fungi that is peculiar to the peach root, which is not found in many other roots as well. In my examinations I have found fungi growing upon the outside of the larger roots, but in every case I have turned immediately to the oak root and found the same condition of things there, and the oak did not have the yellows, and as far as could be seen, no disease of any sort. Not having found any signs of a fungoid growth in or on the root that is not found on the roots of most any tree, I do not believe that this disease can be transmitted from one tree to another by the first means given above.

As to the second, if the fungus that causes the disease has had time to mature and give off its spores, it is probable that many of them would fall upon the ground round about the base of the tree, and thus, if the tree is removed and another put in its place, the spores may, by some means, get upon the bark of the new tree and there, germinating, push their filaments into the tissues.

But this can not often be the case, as cases are on record where orchards have been planted on the same ground from whence diseased trees have been removed, and remained healthy.

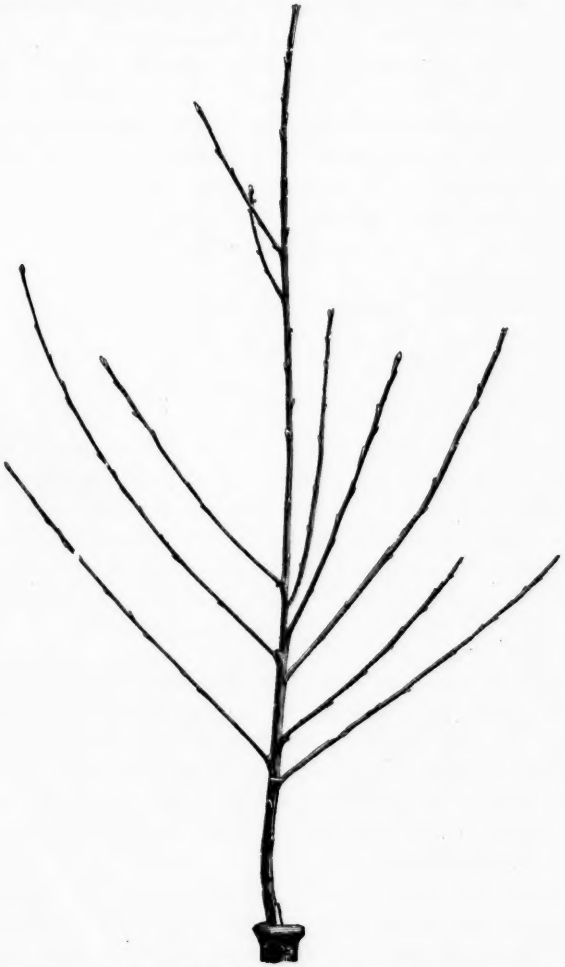

FIG. 1.—Healthy limb of peach tree.

I have no doubt that by using the buds of diseased trees in budding, the yellows may be carried from tree to tree; for living mycelia or some of the fruit-bearing filaments may be present in

the bud and thus when placed in the new tree the fungus continues to grow and the spores to germinate, and soon the tree succumbs to the disease.

The transmitting of the spores or mycelia by the pruning knife, is still an obscure method of dissemination. There is no doubt, however, that the disease is carried in this way very often.

Another and very important method of dissemination, is the transplanting of trees from diseased districts. Perhaps and probably, the yellows is introduced into new localities as often in this way as in any other. We can not accuse any one of dishonesty in selling plants which are diseased, for many do not know what the symptoms are, and still others honestly believe that it is nothing of importance.

I have left what I consider the most important method until the last. It is the spreading of the disease by the germs or spores being carried by the wind. It seems to me that the appearance of the yellows in isolated places and localities is strong evidence of this. Some may ask, why is not the disease more general if this is the case? I think that it can be affirmed that the disease is already general. It has been reported from all the leading peach districts and new localities are found every season. Especially is its sudden appearance in orchards at a short distance from infected districts to be taken into account. It is well known that no matter what the conditions of the atmosphere may be, the spores of fungi are always floating about, wafted hither and thither, lighting upon various organic individuals, until the true host is found, and then remaining only to send into the tissues its filaments, forming its mycelia, and finally throwing off other spores to be transported in a like manner as were those of their parent. If this trouble has its origin in a fungoid growth, the spores are just as certain to be carried from place to place by the wind as are those of any other species that grow upon other plants.

It will be seen from the above discussion upon this division of the subject, that I have included what is generally placed under the head, "Is this disease contagious?" Believing that it is not a constitutional disease, but one due to a parasitical vegetable growth, I think that it is more proper to say that the disease is disseminated in this way or that, rather than to say that it is contagious and may be caught by the healthy tree.

CAUSE.

The most important part of the discussion we now have to consider; for, knowing the cause, we can then suggest a remedy much more easily.

FIG. 2.—Unhealthy limb, showing the abnormal branchlets.

The yellows have been attributed to both animal and vegetable origin as well as to exhaustion of the system of the tree. The former has had many advocates, but these are becoming fewer

every season. As no facts in support of this theory have ever been published to my knowledge, I shall consider it no further.

The weight of the evidence is in favor of the vegetable origin, and, from my observations, I firmly believe that it is due to a fungoid growth. Thos. Taylor, of the Department of Agriculture at Washington, claims that he may have discovered the cause of the disease in a species of Nœmaspora. But the same form is reported as occurring on other trees that received no harm from its presence. Spores of this genus are known to be in the air, and may as often light on other trees as on the peach; and it has been demonstrated that they will develop upon the oak bark as well as on that of the peach, when the conditions are favorable. Some may wish to ask: "Is not that upon the oak a different species?" This is a just and scientific question that immediately arises when such a fact is reported in an investigation like this; my answer will be apparent soon. First, however, let us see how Mr. Taylor proceeds to experiment:[1] "On the 1st of July last I commenced a series of experiments, by the moist process, with the bark of a peach tree affected with the yellows. Into five glass receivers I placed, respectively, a few drops of water, just sufficient to form a moist atmosphere in each. Into No. 1 I put a piece of bark affected with the yellows; into No. 2 a piece of bark from a healthy peach tree; into No. 3 a handful of peach leaves from the unhealthy tree; into No. 4 a similar quantity from the healthy tree; and into No. 5 portions of bark from the healthy and unhealthy trees mentioned. All the specimens were secured from the outward atmosphere. The temperature of the room in which the specimens were kept was frequently at 90° F. *These conditions were highly favorable to the development of such fungous germs as mature under excess of heat and moisture.*" (The italics are mine.)

After due time has elapsed, he finds mycelia and spores of Nœmaspora on specimens in receivers Nos. 1 and 5, and says that seemingly the healthy bark in No. 5 was not affected by the contact with the unhealthy bark. We are left entirely in doubt as to what occurred in receiver No. 2. I have carefully followed his experiments in my own work, and am able to report that the same forms of Nœmaspora may be found on the healthy bark as well as on the unhealthy, and further, that the same forms are

[1] Mich. Pomological Report, 1872, p. 593.

also found upon and may be developed on the oak bark. I tried the experiment with two specimens each of the healthy and unhealthy peach bark, and also two specimens of the oak bark. The directions given above, from Mr. Taylor, were closely and carefully followed. The healthy bark used was from vigorous

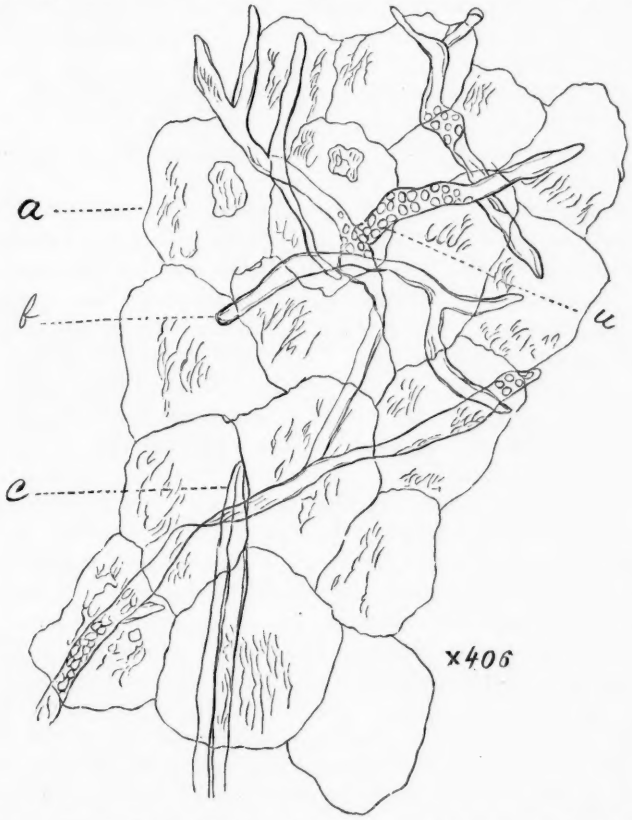

FIG. 3.—Filaments of a fungus found in the tissues of the fruit, and drawn with camera lucida (× 406). *a*, cells of the fleshy portion of the peach; *b*, filaments of the fungus, showing the globular bodies, and at *u* perhaps the fruit just forming; *c*, portion of the hair of the peach skin.

trees growing at my home in Ann Arbor, while the unhealthy specimens were from South Haven, Mich.

Some, and perhaps I might say many, think that the disease is caused by a fungus in the tissues of the root, but none, to my

knowledge, has ever been recorded as occurring there. I have already sufficiently discussed this theory under the head *Dissemination of the Yellows*, and think that nothing further can be said about it unless more facts are brought to light. Nevertheless, I wish to quote a passage—a statement concerning this matter which my observations strongly confirm: [1] "The fungus found upon the roots of decayed peach trees is indigenous to all dead and decaying woods, and is the effect, and not the cause of such decay. Many thousands of trees which have been stricken by the disease, have been removed by 'drawing out;' the crowns, and roots of such trees invariably show a sound and healthy appearance."

Some have suggested that the disease might be zymotic in its nature. Mr. C. H. Peck, State Botanist of N. Y., has examined diseased specimens with this idea before him, and his results I give in full:[2] "The juice of an affected peach was carefully examined, but a power of four hundred diameters failed to reveal any spores or ferment cells. Thin sections of the leaves were made, and the leaf cells examined. A marked difference was observed between the cells of leaves from healthy trees and those of leaves from diseased trees. In the former the cells were well filled with a uniform mass of green chlorophyl, in the latter the chlorophyl was badly disorganized, very much broken up, shrunken and discolored. Many of the cells appeared to be nearly empty, and one or more minute, globose, shining bodies were seen among the fragments of the chlorophyl. An important step seemed now to have been taken in the investigation, but farther examination convinced me that these shining bodies were only the altered nuclei of the chlorophyl. It is scarcely possible that they could be foreign organic bodies, for how could they enter the walls of the unruptured cells? It was found that leaves discolored by the attacks of insects had the chlorophyl of the faded cells in a similar shriveled and abnormal condition. Various autumnal leaves, colored by nature's process, show similar shining nuclei in their cells, which also sometimes have their endochrome in a collapsed condition. Nothing like a ferment cell was disclosed in the leaves; but whatever may be the cause of this peculiar condition of the chlorophyl in leaves from affected

[1] Michigan Pomological Report, 1878, p. 254.

[2] *Cultivator and Country Gentleman*, Oct. 30, 1879.

trees, it is easy to see that it must be a serious matter to the tree. The leaves are its lungs and its stomach. Respiration and digestion are carried on through them. If, then, the active vivifying power of the chlorophyl is impaired, as it must be in such a disorganized condition, the sap must cease to be properly elabo-

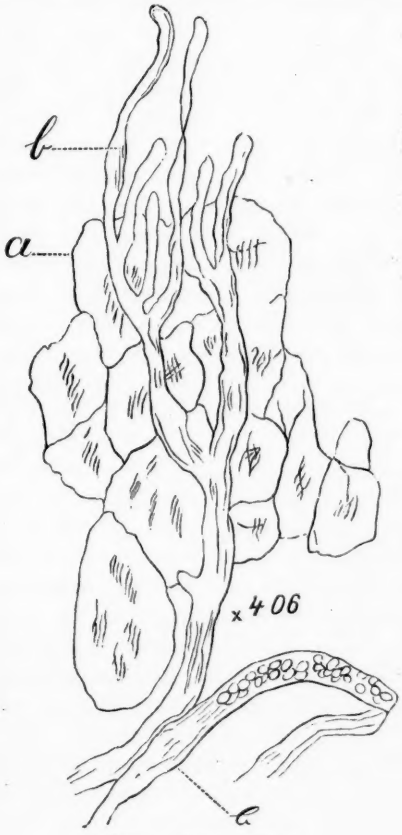

FIG. 4.—Same as Fig. 3.

rated, and the tree must suffer. It is very much as if a man were afflicted at one time with both consumption and dyspesia. No wonder that the tree at length dies."

To observe the action, method of growth, position and the character of this intruder, has been the object of my work since

the 1st of August, 1878. I have endeavored to do my work carefully, microscope in hand as a constant companion, and will now give the results of my labors, and present what I verily believe to be the cause of the disease.

From the start I have worked with this idea before me; that if the disease was caused by a fungus, this particular fungus must be present in the tissues of the tree as it stands in nature, or, in other words, *the conditions natural to the growth of the tree must also be natural to the development of the fungus.* Making this the basis of my observations and experiments, I did not produce the conditions favorable for the growth of most fungi, viz., a moist atmosphere or a high degree of warmth, but simply examined the specimens as they were gathered from the diseased trees and sent to me. The specimens, when I examined them, were all in good condition; the fruit was not in the least decayed, but in all particulars perfectly natural. Some of the peaches were immediately sliced and placed in alcohol on their arrival, and others were examined while fresh. The results were the same in both cases.

For the sake of convenience I will give the results of the examination of each part of the tree in the order of succession of those parts.

1. *Roots.*—First, a specimen four inches long and about one-eighth of an inch thick was examined; sections being made one-fourth inch distant from each other. Second, a root four inches long and one-half inch in diameter, sections being made as before. Third, a root of the same length and one inch thick was examined as in the first specimen. Fourth, sections cut in no regular order from roots of various sizes and trees. All of the above sections were examined with objectives varying in their magnifying power between 75 and 625 diameters, and in no case was any fungoid growth seen in the tissues nor anything in the least abnormal except the loose structure which has been mentioned before.

2. *Trunk.*—Many sections were made from various sized specimens, the largest two inches in diameter, and the smallest, one inch. Sections of the bark showed rather too much coloring matter, and in the inner bark of the larger specimens I noticed an abundance of mycelia, the characters and appearance of which will be given under the head *Fruit.* The smaller specimens did

not show near as much of the fungoid growth as did the larger, and, indeed, I examined several sections before I found any mycelia at all. In both cases it was situated on the under side of the inner bark, next to the cambium layer, and many of the filaments penetrated and ramified through this layer. I also noticed, in the larger specimens, mycelia between the layers of wood. An examination of the abnormal pigment spots, scattered through the pith and woody portions, revealed nothing but cells filled with the coloring matter. The outer bark in no case showed signs of any fungoid forms.

3. Branches.—An examination of the larger branches revealed nothing at all different from that given above for the trunk of the tree; but some of the smaller branches and the growing ends of the larger or main branches, showed marked peculiarities indeed. In these the tissues seemed to be completely filled with mycelia, and in one case the bark was apparently split.[1] The branches from which these specimens were taken had many abnormal branchlets, and hence the theory advanced in the first part of this paper that these abnormal shoots were caused by the filling up of the tissues of the growing ends, thus turning the flow of sap to the lateral buds.

The filament found in the branches was in all respects identical with that found in the trunk of the trees, and will be described further on.

4. Leaves.—Those examined were mostly from the abnormal branchlets. The chlorophyl in all was completely disorganized, and in general the appearance was the same referred to by Mr. Peck. It seemed at first that this must be caused by dry weather or lack of cultivation, but on further examination filaments of a fungus were found to be present, to a greater or less extent, in nearly all the leaves examined. I noticed but two spores of any sort in the tissues, these were teleuto-spores and without doubt belonged to some leaf fungus other than the one the filaments of which were found in the tissues. On a few of the leaves sent me I found the fungus *Ascomyces deformans*, which causes the "curl leaf" disease so common at the present time in many localities.

The filaments of the fungus alluded to first, were of the same character as those that will be described under the next head.

[1] A friend to whom I showed this, suggested that this splitting might have been caused by the pressure of the growing mycelia within the tissues.

Mr. Thos. Taylor says, that [1] "it is evident that the healthy leaves possess an antiseptic substance which prevents the growth of the common moulds on them." The results of my experiments have led me to the same conclusion. An analysis of the

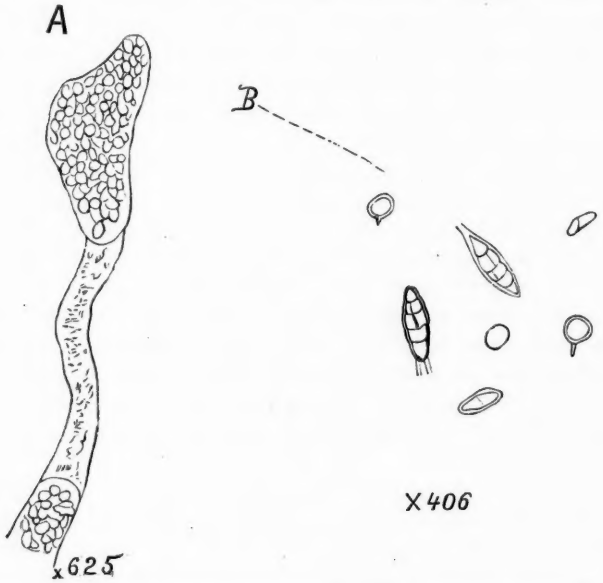

FIG. 5—A, fruit of a fungus found just beneath the skin of the peach. This resembles a portion of the fruit of the Saprolegnieæ (× 406); B, spores formed in the peach. Drawn with the camera lucida (× 406).

leaves show that there is a much larger proportion of moisture in the diseased leaves than in the healthy. I analyzed several specimens of each and found a greater difference between them than Mr. Taylor reports.[1] However, this is not important, as the per cent. may and does vary much. The average of my analyses was as follows:

HEALTHY LEAVES.

Moisture	25.62
Organic matter	69.24
Ash	5.14
	100.00

[1] Mich. Pomological Report, 1872, p. 597.

UNHEALTHY LEAVES.

Moisture	39.16
Organic matter	57.08
Ash	3.76
	100.00

There is a small per cent. of volatile matter in the leaves that in the estimation would raise the per cent. of moisture slightly.

It will be seen from the above results that the unhealthy leaves are much better fitted to become the host of a parasitic fungus than are the healthy ones.

As to what causes this abnormal amount of moisture, I have already formed an opinion, but desire to confirm it by further experiment, the results of which I hope to include in a future paper devoted entirely to this subject.

5. Fruit.—I found that the most satisfactory results were to be obtained from an examination of the fruit, and therefore spent the greater part of my time upon that portion of the tree. Mycelia in abundance were found just beneath the skin, extending into the fleshy parenchyma a short distance. This fungus—identical with that found in the other parts of the tree—was unicellular, branching, and much enlarged in places. In some places the filaments were apparently filled with small oil globules and bodies closely resembling spores. In only a single instance did I find a distinct fruiting filament. That I did not find more of the fruit I regret very much, for in order to know fully the characters of a fungus, its fruiting system must be carefully studied.

The single specimen of the fruit I examined is shown on Fig. 5. It was found beneath the skin of a prematurely ripened peach, detached from the remaining filaments present with it, and yet evidently it belonged to the same growth.

Several peaches were examined, and in no case did I fail to find the same branching form.

The method of branching and the form of the filament (shown on Figs. 3 and 4), as well as the oil globules which they contained, and the fruiting system of this fungoid growth, immediately reminds one of Saprolegnieæ, to which division of fungi this form seems to belong. And as the final result of my investigation up to the present time, I believe this parasitical vegetable form to be at least a part of, and probably the whole cause of this disease.

Many modes of procedure have been suggested to effect a cure

and thus save the trees. Those persons advancing some of them claim that their *modus operandi* is a sure and active agent in bringing about the desired end. But most of the modes are simply theoretical and always fail. In most cases when a cure has been reported, it has afterwards been proven that the tree did not have the yellows at all. For example, one who attributed the yellows to an animal origin, used Paris green, throwing it over the tree with a pump, and the next year the trees that he supposed to be diseased were in a healthy bearing condition. It was afterwards shown that the symptoms of the yellows were

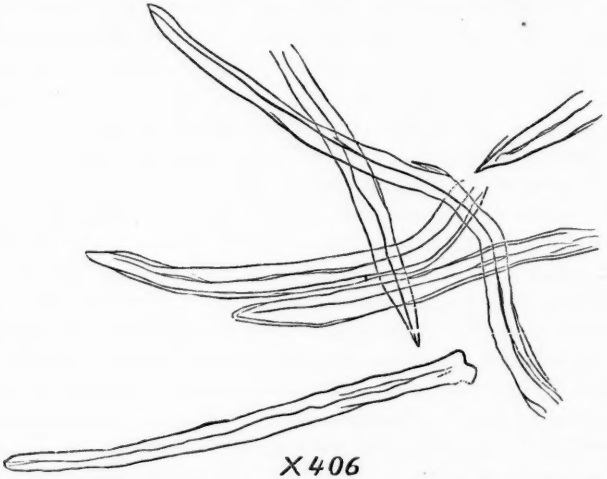

FIG. 6.—Hairs on the skin of the peach (× 406). Drawn with camera lucida.

produced indeed by an animal, but that animal was simply a plant louse! The tree being covered with them, the Paris green was an effective agent in ridding the orchard of its pest.

Some have used hot or boiling water, pouring it about the roots of the trees, and in many cases they have reported the disease reduced; but in every case that has come under my observation it has failed.

It is not at all surprising that the means used—including the whole category of remedies—have often been reported as producing a satisfactory cure, for *many of the temporary injuries liable to come upon a tree, will, in most instances, produce many of the symptoms of the yellows;* these are the cases that have been

cured. If they had been left alone nature's physician would have cured them also. *Nature does not cure the yellows.* A severe frost will kill the heart wood of a tree, producing some of the characters of this disease, but the exterior—the vital part—remaining unharmed, it will soon return to its healthy condition.

Disinfectants have been recommended. Mr. A. G. Gulley says upon this subject:[1] "But I look with hope in another direction, that of preventives by which we can disinfect the trees or enable them to resist or throw off the disease. This idea is strengthened by the evidence that a fungus may be the cause. We know that the low forms of vegetable life are destroyed by various substances and cannot exist in their presence. If the disease is of that nature, by the introduction of some of those materials we shall disinfect the trees, destroy the germs or prevent its growth."

We agree with Mr. Gulley in this, but as far as experiments have been tried, the right substance has, as yet, not been found, and it is a query whether or not the very agent that may be destructive to the fungus may not also, being unnatural in the circulation of the tree, destroy it also.

Mr. Taylor[2] recommends the use of sulphates and alkalies as a wash to be used on the bark and roots of the trees. It must be borne in mind, however, that he is inclined to attribute the disease to the agency of a species of Nœmaspora, which I think has been clearly shown is not the cause, but that the fungus that produces the yellows, both fruit and mycelia, is more internal than he claims, and would thus necessitate the introduction of the acid, alkali or any disinfectant into the circulation, which would produce an abnormal condition of things physiologically, and injure the tree itself. I have no doubt, however, that if enough of these reagents were used the fungus would be destroyed.

Dr. Kedzie's recommendation[1] of the use of potash and phosphoric acid or superphosphate of lime as an experiment, we consider as simply a good preventive, and have discussed it under that head.

From my work and observations, and from, I think, a scientific standpoint, letting theories alone, the only cure that I can recommend, is, that the fruit grower, when he notices that any tree in his orchard has become diseased, root it out carefully and burn

[1] Mich. Pomological Report, 1878, p. 252.
[2] Mich. Pomological Report, 1872, p. 596.

every part. If each one takes this care and is also careful to keep the orchard up to the standard cultivation, this malady, which is troubling our orchardists to such an extent at present, will surely fall and soon become a thing of the past.[1]

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INTELLIGENCE IN A SNAIL.

BY W. H. DALL.

SOME time since a relative told me a remarkable story about a child who had pet snails which recognized her voice and distinguished it from that of others. As such a development of intelligence has not hitherto been reported among mollusks, I was much interested. By the kindness of the lady from whom the story was first heard, and the intervention of Mrs. Lay, wife of Bishop Lay, formerly of Arkansas and now of Maryland, one of the family, who was cognizant of the facts, was reached, and an extract from her letter is appended. I may add that Mrs. Lay speaks in the highest terms of the accuracy and clearheadedness of her correspondent (then and now a resident of Arkansas), and remarks that both she and her sister were remarkable for the ease with which they established friendly and confidential relations with the birds and animals about them. The father of these ladies, whose name I suppress merely because I have not their authority to print it, was chief clerk in the State Department under the secretaryship of Daniel Webster.

The malacologist, familiar with pulmonates, will recognize in the following quotation many facts which indicate the accuracy and unusual powers of observation of the writer. It is probable that the snail was one of the group to which *H. albolabris* belongs, at all events it was a native of Arkansas and one of the larger species. It would be highly interesting if some of our lady friends would repeat the experiment with different kinds of snails, and determine by additional evidence whether they are capable—1st. Of recognizing a call or sound; and 2d. Of distinguishing it from other similar calls or sounds; which the snail in question appears to have done.

[1] Mr. David De Tarr, of the Zoological Department of the State of New York at Albany, and Mr. A. B. Covert, of Ann Arbor, Mich., were, during a part of the time of the above investigation, associated with me. To Mr. De Tarr may be credited the finding and drawing of the fungoid form figured on Fig. 4.

The lady, after stating that her sister Georgie was, from the age of three years, quite an invalid and remarkable for her power of putting herself *en rapport* with all living things, continues: "Before she could say more than a few words, she had formed an acquaintance with a toad, which used to come from behind the log where it lived, and sit winking before her in answer to her call, and waddle back when she grew tired and told it to go away. When she was between five and six years of age, I found a snail shell, as I thought, which I gave her to amuse her, on my return from a picnic. The snail soon crawled out, to her delight, and after night disappeared, causing great lamentation. A large, old-fashioned sofa in the front hall was moved in a day or two, and on it we found the snail glued fast; it had crawled down stairs. I took a plant jar of violets and placing the snail in it carried it to her, and sunk a small toy cup even with the soil, filling it with meal. This was because I had read that French people feed snails on meal. The creature soon found it, and we observed it with interest for awhile, as we found it had a mouth which looked pink inside and appeared to us to have tiny teeth also. We grew tired of it, but Georgie's interest never flagged, and she surprised me one day by telling us that her snail knew her and would come to her when she talked to it, but would withdraw into its shell if any one else spoke. This was really so, as I saw her prove to one and another, time after time. At one time she found a number of eggs. To the best of my recollection they resembled mistletoe berries, though much whiter. They hatched, and she had fifteen or twenty little snails which used to assemble round the cup of meal which had to be frequently replenished. The old snail once fell down on to a brick pavement and its shell was fractured and a small piece lost, but Georgie pasted a piece of calico over the hole and it seemed to do very well. What became of the happy family I do not remember, nor can I tell how long my sister had them. I do not know of any more easily kept pet. If there is anything else which I have forgotten, I shall be happy to write further particulars if I can recollect them."

"Georgie," my correspondent adds, "died about fourteen years ago."

An observer, who noticed and remembered the pink buccal mass, the lingual teeth and the translucent mistletoe-berry-like

eggs, and after such an interval of time could so accurately describe them, is entitled to the fullest credence in other details of the story, and I have no doubt of its substantial accuracy, in spite of its surprising nature.

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BOTANICAL NOTES FROM TUCSON.

BY JOS. F. JAMES.[1]

IT is not very many years since the Territories of Arizona and New Mexico were regarded as the most forbidding countries in the world. Every one who went there carried his life in his hand, and if he escaped the fierce Apaches and returned home with his scalp and a whole skin, he was among the favored of mortals. Within the past five years much of this has changed, and the civilization brought about by the advent of railroads and the influx of determined miners, has been remarkable. A sojourn of some weeks in Arizona, gave me an opportunity to see some of the life of that quarter, and in this paper I purpose speaking of some things to be seen and found there.

The city of Tucson is the largest and most important settlement in Arizona. It is essentially Mexican; settled as long ago as the end of the seventeenth century, it is one of the oldest towns in our country, and from its foundation to the present time, it has continued to be the center of the trade of the Territory. Situated in the midst of the mining regions, it furnishes supplies to mines on the north, east and south, and for the State of Sonora especially, is a depot of supplies. It is estimated that at certain seasons of the year the trade between Tucson and Sonora amounts to as much as a million dollars per month, the imports to the United States consisting of fruits, tobacco and whisky, and the exports of calicoes and other dry goods. These are carried for a distance of 300 or 400 miles on the backs of mules through passes in the mountains, and on account of the extreme duties into Mexico, much smuggling is constantly going on.

The streets of Tucson are narrow and unpaved; many of them are a foot deep in finely powdered dust, and a sudden gust of wind, such as frequently arises, sweeping along the ground, raises a whirling cloud so thick that it is impossible to see across the street. All of the houses are built of "adobe," the Mexican

[1] Custodian Cincinnati Soc. Nat. Hist.

name for sun-dried mud bricks, are generally but one story high, and have flat roofs. This kind of a house, with walls often two feet in thickness, is said to be much cooler in summer and warmer in winter than any other, and the thickness of the walls ought surely to keep out both heat and cold. To keep out the heat, however, is a much more important consideration than the cold, in a climate where the mercury often rises to 120° in the shade, and sometimes to 125°. In the summer the heat is something fearful to think of, but the air is so dry and so pure, that a degree of heat unbearable in our climate, can be easily endured in that one. During the summer many of the people take their cots into the yard, on to the sidewalk, or on the house tops, and sleep with the sky for a roof. In Yuma it is a common sight to see, early in the morning, people getting up and making their toilets in the open air.

The bricks of the houses are about twenty inches long, eight inches wide and three inches thick. They are fastened together with a mortar made of earth mixed with water, the sidewalk often being dug up to furnish the principal ingredient. The houses are built in the form of a square or oblong, with a court in the center, thus allowing a free circulation of air and making the house much cooler. The better class have a covered porch, or "remada," round the court, and here the people sit and work during the day, and sleep during the hot weather.

There are many curious sights to be seen in and about Tucson, curious at least to Eastern eyes, but it is not my intention to speak of them here. During a stay of some six weeks in the city, I collected the plants of the immediate vicinity, and it is to them I shall refer at present.

The commonest plant of all the country about Tucson is known locally as the mesquite. Under this general name there are included several very distinct trees, but with the same general habit, which are all grouped under the name of mesquite. Sometimes they are scattered singly over the desert; and sometimes they are clustered together in a dense thicket. The trees are low and scraggley, with the branches sweeping the ground on all sides. They have handsome acacia-like leaves, and long branches of bright yellow flowers, succeeded by the pods which serve some of the Indian tribes as food. Concealed by the leaves are myriads of thorns in all stages of growth, but all hard, sharp and tough. In attempt-

ing to penetrate this brush, a gentle tickling at the back of the neck makes you aware of something in store for you, and as you turn to investigate, a branch seizes you by the sleeve, and another is prepared to enter your eye. Something sticking in your flesh

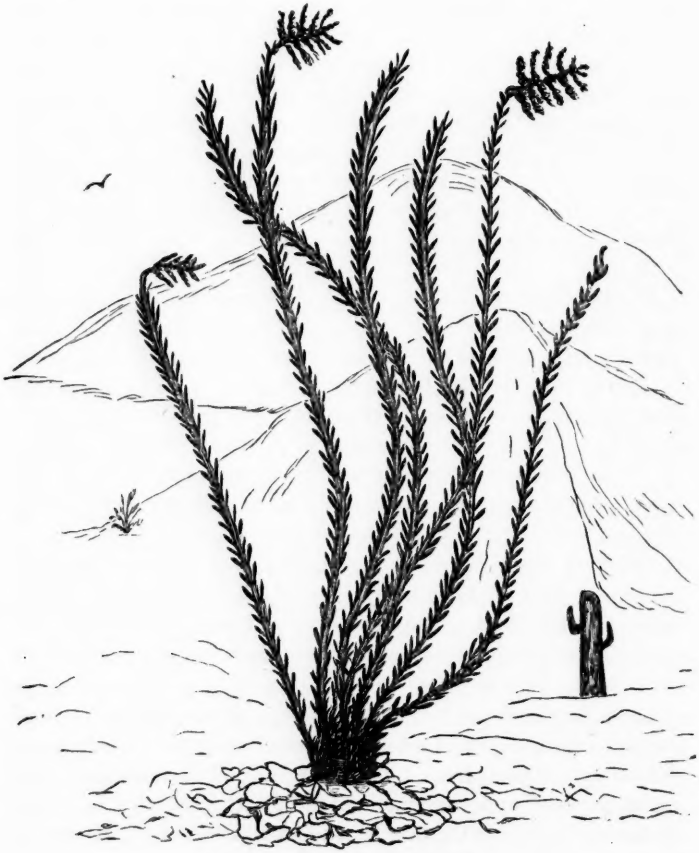

FIG. 1.—*Fouquiera splendens* Engelm.

calls your attention in another direction, and you find a cactus has fastened itself to your pantaloons. Devoting your attention to it, you finally succeed in detaching one thorn from your leg, and stick ten in your fingers, transferring them from one hand to

the other with the greatest ease. Then your hat will be scraped off, your face will be scratched, and you will feel like saying something wicked. You think you see a bird sitting on a nest in one of the trees, and at the risk of your neck climb up to it, only to find it empty. When you reach the ground again, it is with a dozen thorns in your leg, more in your hands, and your face and neck bleeding from scratches. Should you try to sit down, you will find yourself located on a patch of ground already occupied by thousands of the sharpest kind of thorns; by this time you will probably have come to the conclusion that a mesquite patch is no place for a picnic and you vacate the premises.

Associated with the *Acacia greggii*, with yellow flowers in racemes, and long and crooked pods, is the *Acacia farnesiana*, a shrub from six to ten feet high, bearing great numbers of small yellow balls of flowers, which are very sweet scented. It is largely cultivated in China for the sake of the flowers, for out of them is made a delicious perfume. The creosote plant, *Larrea mexicana*, is very abundant on the deserts about Tucson, but a more worthless plant it would probably be difficult to find. Torrey says it is used externally for rheumatism; but no animal seems to feed upon it, and it is useless for fuel, for it can scarcely be made to burn.[1] It has been the subject of much discussion in California, and papers read before the Academy of Natural Sciences say that it produces such quantities of "lac dye," that a profitable business could be carried on by collecting and exporting it. As far as I have observed in examining a large number of bushes, a very small proportion only produces the material for the dye, and these in such small quantities as to make it hardly worth the trouble of gathering.

Still another very common and at the same time a very curious plant is the *Fouquiera splendens*, one of the Tamariscineæ, and known to the Mexicans as "ochotilla." It grows all over the deserts of Arizona and among the rocks on the mountains. The branches are long and whip-like, armed with innumerable sharp, curved thorns an inch or more long. The flowers are of a bright scarlet, and form racemes at the ends of the branches. The leaves are three-parted, sessile, and generally appear after the flowers have gone. It is used very extensively by the Mexicans for fences, and oftentimes one sees a fence of this plant, the pieces stuck into the

[1] Torrey's Report in Emory's Reconnoissance of N. Mex. and Cal., p. 138.

ground and bound together with raw hide and bunches of the bright scarlet flowers at the top of the stalk. The plant is cer-

FIG. 2.—Flowers of *Fouquiera* (*spinosa*) *splendens* Engelm.

tainly one of the most striking of all found on the deserts of Arizona.

Another form is the "Palo erde" of the Mexicans. It is the *Parkinsonia torreyana*, one of the Leguminosæ. It grows to be some fifteen or twenty feet high, and all the branches are of a light-green color. The flowers are of a bright yellow, in long racemes, and quite sweet-scented. Those trees noticed on the Colorado desert were surrounded by swarms of bees, apparently finding excellent food among the blossoms. When in flower, no leaves are to be seen, and when these come out they are very small and inconspicuous.

The cacti form a most conspicuous feature of mountain and desert. By far the most conspicuous and remarkable form is the *Cereus giganteus*, locally known as the "saguara" cactus. It was first brought to the notice of the scientific world by Emory's Expedition from Fort Leavenworth to San Diego, in 1848, and in his report was given its present name. It is an upright fluted or ribbed pillar, each rib covered from bottom to top with a mass of sharp, straight thorns. At the top of the stem are the long tubular white flowers, with the petals just peeping from the calyx, and with the interior filled with an innumerable mass of stamens. After the fruit is formed the flower, in drying, has the pleasant odor of Calycanthus. When ripe the fruit splits open at the top, displaying the bright red scarlet of the interior, dotted with the

numerous small black seeds. It is much relished by the Mexicans, but to me has a mucilaginous and sweet, but insipid taste.

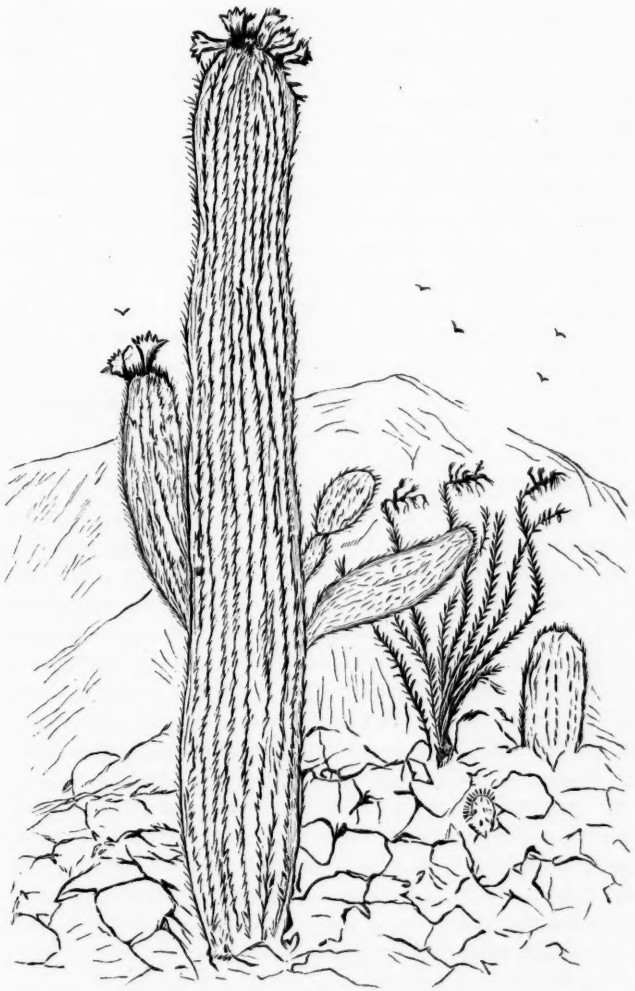

FIG. 3.—*Cereus giganteus* Engelm.

Birds are very fond of it and often secure it before any one else can get it. The bright red color of the inside of the fruit can be

seen a long way, and doubtless serves to attract birds who can thus disseminate the seeds.

There is no more striking and conspicuous form of vegetation than this *Cereus giganteus.* It often grows to the height of thirty feet, straight as an arrow and of nearly the same size from bottom to top. The internal framework is made up of a number of hard woody cylinders, the spaces between being filled up by pithy matter; sometimes it is branched, but in a stiff and ungraceful manner, the branches jutting out almost at right angles and then turning and ascending parallel to the parent stem. Sitting on the rocks near some of these plants, when the wind was blowing strongly, the sound of it passing between the spines resembled strikingly the soughing of the wind through the branches of a pine tree; and shutting the eyes it required but little imagination to be transported to a northern pine forest, listening to the wind blowing through the branches. It is strange that the action of the wind in two such different localities as the hot deserts of the South and the cool mountains of the North; and playing upon two such different types of vegetation as a cactus and a pine tree, should produce sounds so similar to each other.

Another species of the family is one commonly called the "nigger-head" or "barrel" cactus, a Mammalaria. This often grows four feet high, sometimes only half as much, and almost globular in shape. It has many ribs converging to the top, and each bears innumerable clusters of spines. The lower ones are long, straight and horizontal; some of the central ones stand upright and the largest in each cluster is curved over so as to form a sharp hook. These are very tough, and while the crooked ones serve the Indians for fish hooks, the straight ones are used as needles. The flowers of this species are generally red. A much smaller species of this form, also a Mammalaria, is very common among the rocks on the mountains near the city. The spines are black and very small, but sharp. Still another species *(Opuntia arborescens)* grows sometimes to be almost a tree, and is covered with a mass of the most awful looking, and feeling thorns. These seem to be covered with a sort of sheath, easily removed, and easily sticking into one's fingers. The thorns are sharp enough and long enough to go through pantaloons and boot top, and stick viciously into the skin. The Mexicans call this the "ochoya" cactus,

and often finding a straight plant and about the right size, will clean off the thorns, and then by much labor clean out the pith from the stem, leaving a stick which is full of holes of all sizes, and which makes a useful and ornamental cane. Then the common prickly pear (Opuntia) forms immense patches, covering acres of ground, and sometimes forming hedges eight and ten feet high. The fruit is known as a "tuni," and is eaten by the Indians and Mexicans. It is of a very mucilaginous nature, sweet and insipid, but not very palatable to ordinary tastes.

It is characteristic of many of the plants of the desert to be provided with thorns, and where there are many thorns there is relatively a small amount of leaf surface. The immense number of cacti are by no means the only spine-bearing plants, and one of the most remarkable, outside of that family, is the *Holacantha emoryi*. This grows in the dryest and most barren spots of the desert, and forms a large mass of what appears to be nearly all branches and thorns, but it is intermixed with innumerable clusters of small yellow flowers. The small leaves are not apparent when the plant is in bloom, but come out soon afterward. Another plant of a peculiar character, common at Tombstone, seventy-five miles south-east of Tucson, is the *Nolina texana*. It has a long branching spike of white flowers, intermixed with linear, sharp-pointed leaves. At the base of the stem great numbers of long sharp leaves spring in all directions, some being eighteen inches or more long, and presenting a formidable appearance. It abounds in the dryest localities.

Besides the desert itself, with its peculiar flora, there are one or two other places in the vicinity of Tucson which are excellent for plant gathering. One is in a patch of low ground where a small stream has been dammed up forming a pond which serves to keep the ground in the vicinity quite moist. Here some few familiar forms are to be found, mixed with others entirely unfamiliar. Among the former, growing very luxuriantly, is the *Ampelopsis quinquefolia*, apparently the same as the eastern form, *Cephalanthus occidentalis*, *Apocynum cannabinum*, *Samolus valerandi* var. *americanus*, *Medicago sativa*, *Scirpus olneyi*, similar to *S. pungens*, and *Juncus balticus*, a native of Europe as well as of the Eastern United States. Among the unfamiliar forms is *Amorpha californica*, a small shrub with pinnate leaves and long racemes of purple flowers, very similar in appearance to *A. fruti-*

cosa. Another is the *Antirrhinum maurandioides*, a pretty climbing plant, with large blue flowers and sagittate leaves. It is very common, and climbs over all plants within its reach. The *Cuscuta californica* grows in such profusion as to completely overwhelm many other plants, and gives a peculiar yellowish appearance to all, while *Convolvulus occidentalis*, with large white flowers, covers large patches of ground with its trailing stems. *Castilleia linariæfolia* is very common in patches, and is tall and slender, with bright red flowers and linear leaves.

Almost the only other locality in the neighborhood of Tucson favorable for the growth of plants, is along the Santa Cruz river, a small stream which rises to the south of the city, flows past it, sinks into the ground some ten miles on the other side, rises again to the surface, and finally empties into the Gila river. For some distance along its banks the Mexican women use it as a wash tub, and along a special part of it can be seen, at all times, numbers of women washing clothes. They beat them on the stones and wear out the clothes as much as take out the dirt. Near the stream, climbing extensively over the bushes, grows *Clematis drummondii*, with three-parted leaves and large clusters of white flowers. Here also is found the *Philabertia cynanchoides*, one of the Asclepiadaceæ. It has extensively twining stems, arrow-shaped leaves and small clusters of greenish yellow flowers. A mile further up the stream we come to where it has been run into a sort of canal to run a mill, and along the side of the mountain, below the canal, where the ground is always moist, is a good growth of vegetation. Here is found *Aster pauciflorus*, with long linear leaves, and flowers with blue rays in branched corymbs. The larger growth consists principally of willows and poplars, *Populus fremonti*, var. *Wislizeni*, being the most common. The *Tessaria borealis* is another tree with the aspect of a Baccharis and a willow. It has small, linear, silky leaves and rose-colored flowers in dense clusters. The down of the seeds is used extensively by the birds for lining their nests.

Along the banks of the stream is a little Hydrocotyle, a Ligusticum, *Eleocharis palustris* and other plants loving damp localities, and in the water *Ceratophyllum demersum*, *Potamogeton natans* and *P. pectinatus*. At the other side of the city, but still within the influence of the river, grows *Tribulus grandiflorus*, one of the Zygophyllaceæ. It has large, beautiful, orange-colored

flowers, with pinnate leaves, hairy and procumbent stem, and is one of the most attractive flowers of the region. The *Juglans rupestris* grows sparingly along the roads, and a tall Acacia *(A. hirta?)* with a straight branching stem, round bunches of white flowers and finely pinnate leaves, is quite common.

These are some of the plants which, in a short period of time, and at an unfavorable season of the year, can be found in the vicinity of this, one of the oldest settlements of America. I have by no means noticed all the species collected there, for I have not yet had an opportunity to identify them, and there are no doubt many more species to be found by one spending a year at the place. I have been informed by those who know, that during the summer rains many plants spring up, bloom for a short time and disappear for the remainder of the year. Among the species to be found here are doubtless many which are Mexican forms; but this is nothing strange, for the whole of the flora of Southern California, Arizona and New Mexico belongs to the Mexican region. The climate and geographical features of all are very similar; dry and barren plateaus and mountains, where little rain ever falls and where the heat in summer is very intense; with few streams to water the soil, and these few having an uncertain existence, the beds being nearly dry the greater part of the year. Cloud bursts, waterspouts and sand storms are characteristic of the whole country, and any division which can be made will place Upper Mexico, Arizona, New Mexico and Southern California in the same zoölogical and botanical region.

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EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

—— The scope and aim of the biological sciences are embraced by their two great primary divisions, phylogeny and physiology. Phylogeny states the history and manner of the creation of beings possessed of life, while physiology exposes the forces which are active in creation and other functions of life, and sets forth their *modus operandi.*

All biological research contributes to one or the other of these departments. There are two branches essential to the development of phylogeny, viz: embryology and palæontology. The essential preliminary to both of these sciences is, of course

anatomy (including histology), or in other words, analysis of structure. A rational résumé of anatomy is taxonomy, or systematic zoölogy and botany. For the great department of physiology, knowledge of both physics and chemistry is necessary; and here the biological and physical sciences have their natural inosculation.

The student who is desirous of making a life-work of biological science, will often be at a loss to decide as to the best line of research for him to undertake. Circumstances of an incidental character generally determine his course for him. Such circumstance is the influence of a scientific friend; or the brilliant work of some able man who renders a department attractive. Fashion, which is seen in scientific as in other fields, will sometimes give the direction; but the most usual determining agent is the material for study which may lie most conveniently near the student's hand. Every department has its attractions, and nature presents to the appreciative intellect an *embarras des richesses*, in whatever direction it turns its view.

The science of physiology is the most difficult of prosecution, and has, on this account, made less progress than some of the other branches. Its results, having a direct practical bearing besides their scientific value, awaken greater popular interest than those in almost any other department. The successful physiologist will have many rewards, but his labors will often, like those of Sisyphus, be without satisfactory results.

The study of anatomy is open to all, and in an infinitude of directions. Every biologist must master as many of its details as are necessary as a foundation for a superstructure of one of the other branches. The pure anatomist who correctly portrays the mechanism of living machines, places all other biologists under obligations to him. But before the anatomist can proceed intelligently, he must have a preliminary idea of the character of the animal or plant he investigates. This is first determined by a consideration of the external anatomy of large numbers of species, which is the work of the systematic biologist. Of course the full expression of the relationships, as shown by the resemblances and differences of species, cannot be had until the whole anatomy is known. The first work of the taxonomist is therefore necessarily imperfect, and partly on this account it is the fashion in some quarters to speak lightly of his labors. It is, however, true that taxonomy cannot be done without;[1] also, that when the anatomy, as in the higher animals, develops a great many terms whose relations are to be properly expressed, it requires no mean order of intellect to solve the problem thus presented to it.

[1] Linnæus says (Philosophia Botanica, p. 202): "Botanicus tyro novit classes; candidatus omnia genera; magister plurimas species. Quo plures Botanicus noverit species, eo etiam præstantior est. Cognitione specierum innititur omnis solida eruditio physica, œconomica, medica; immo omnis vera cognitio humana."

Judging from results in this field, this kind of ability is not common, for the most admirable observers are frequently quite unable to appreciate the taxonomic bearings of the facts they have brought to light.

The sciences of palæontology and embryology contribute equally to a true phylogeny, which is already indicated by taxonomy. It is difficult to decide which of these departments is the more attractive. The naturalist who lives in a region where well preserved fossils are abundant, will not weary of exploring the horizons within his reach, and of tracing the structure and affinities of the forms he discovers. A few feet of rock will often separate faunæ more distinct in their characters than those which now inhabit the most widely separated regions of the earth. An expedition of a few miles will yield results of greater importance than the exploration of the fauna of entirely new regions of the earth's surface.

The disadvantages of this pursuit are the generally imperfect character of the remains of ancient life; and secondly, in the case of the vertebrate animals, the expense involved in obtaining them.

The student of embryology, like the anatomist, has his material on every hand. If he take the pains, he can observe the most wonderful phenomenon the world affords, the development of a complex being from a single cell. In the successive stages of growth he will trace the impress of ancient environments, and will read the outlines of the history of descent only less perfectly than the palæontologist. Although embryological study is possible everywhere, it involves much patient and laborious manipulation; more so than any other department, excepting physiology. Its rewards are, however, great.

In the outset of their career, naturalists are often perplexed as to the question of ways and means. To those who must seek a livelihood, two courses are open. One is the practice of medicine, which is a pursuit generally congenial to the biologist, and one which will at least sustain life, and permit of some leisure time for study. The other, and to our thinking preferable course, is the pursuit more distinctively that of the naturalist, teaching his favorite subject. He thus makes it his business, which shall support him. The number of colleges and universities in the United States is large, and is increasing. Each of these must have, sooner or later, a professor of natural sciences. The salaries will often be small, but the investigator desires time rather than money. The supposed necessity for a large income has extinguished many a promising biologist. So long as financial prosperity, rather than intellectual accomplishments and ability, gives position, this will continue to be the case. We hope and believe, however, that it will not be long before intellectual development will have so far progressed in America as to reverse this

order of precedence in the estimation of the general public, and that it will give to the man who produces knowledge, the high position he has always held in the minds of the thoughtful of the human race.

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RECENT LITERATURE.

TYLOR'S ANTHROPOLOGY.[1]—It is only within some twenty years or a little over a generation, that under the enlarged mode of studying nature for which we are indebted to Darwin and others, as well as to German embryologists and histologists, particularly those who have worked from an evolutional point of view, that the science of biology has become well established. Modern physics has recently discovered the law of the conservation of force and other doctrines which have so enlarged the sphere of the physicist. Hand in hand with the genesis of biology went on the development and perfection of the nebular hypothesis, and the rise of a new school in geology, the uniformitarian; while at only a late date has the science of meteorology assumed a definite shape, and later still the science of comparative psychology and sociology. The youngest of the sciences, of which this book is an exposition, is a logical outcome of all the sciences bearing upon life and the physics of the earth, the residence of man. In the fullness of time there has arisen a science of man, or anthropology, the synthesis or flower of all the sciences. Such a science could not have come into existence were not the keystone of the arch supporting it the doctrine of evolution. Old-fashioned ethnologists could go on indefinitely, measuring skulls and classifying the races of mankind, archæologists could industriously unearth forgotten graveyards and buried cities, till every foot of soil on the globe had told its tale of dead dynasties and forgotten cities, but unless a working theory of development from the general to the special, from the crude and unfinished to the perfected; unless different and successive early stages were looked upon as initiatory, as only existing to give rise to something more composite, highly finished and enduring, we could not have had the science of anthropology.

It is from the point of view of progress and growth, of elaboration from simple beginnings, and the origin of the composite manners and customs of modern civilization from the aboriginal arts and habits of savage life, that the new science of anthropology is to be built up and perfected.

Just as the study of the embryology of Ascidians and of the Amphioxus has well nigh revolutionized our conceptions of the vertebrate type, and man's structure can only be understood by a

[1] *Tylor's Anthropology:* An introduction to the study of Man and Civilization. By EDWARD B. TYLOR, D.C.L., F.R.S. With illustrations. New York: D. Appleton & Co., 1881. 8vo, pp. 448.

study of the lower invertebrate as well as vertebrate organisms, so our modern civilization can only be analyzed and clearly understood by reference to the social structures of savage life and the developmental steps by which the savage became a barbarian, and the barbarian threw aside the features of savagery, and after a series of changes, paralleled by the metamorphoses of the butterfly or starfish, assumed the advanced forms and environment of civilized life. Nay, a tolerably exact parallelism may be made between the premature civilization of certain races of mankind and those which more slowly and surely developed into modern and probably permanent types of civilization. The prematuritive type of pseudo-civilization of Peru and Mexico, of Babylon and Assyria, so strikingly suggestive of later and specialized types of civilized life, may be compared to the prematuritive, generalized, prophetic types of Silurian ganoids and Selachian fishes, which flourished as exceptionally perfect forms amid the multitudes of lower organisms about them, and which sank, as it were, and died under the weight of the ill-assorted and unequally perfected assemblage of organs composing their bodies. Anomalous and unintelligible would be the premature and comparatively short-lived pseudo-civilizations of the infancy of our race, were it not written in the rocks that the idea has been worked out again and again in palæozoic history.

Such reflections and considerations as these are provoked by any course of biological study, and by reading Herbert Spencer's writings on sociology and more particularly the modest and able work before us of Mr. Tylor. In the present book the science of anthropology has been, perhaps for the first time, reduced to coherent and intelligible shape. In a simple and yet masterly way the subject is outlined and put into the briefest form. The aim of the author has evidently been to simply sketch out a subject vast and intricate in its details.

We will now give a synopsis of the subject, to enable our readers to form a slight idea of what anthropology is, and it should be premised that the science has been largely built up and promoted by geologists and biologists, who established the fact of the high antiquity of man, which led them to investigate the habits and arts of the prehistoric races, and thus to utilize the results of ethnologists and archæologists, until the missing links between the prehistoric and historic races of mankind could be with tolerable certainty supplied.

Beginning with the fact that man may be divided into races rather than species, our author remarks that: "Altogether, the evidence of ancient monuments, geography and history goes to prove that the great race-divisions of mankind are of no recent growth, but were already settled before the beginning of the historical period. Since then their changes seem to have been comparatively slight, except in the forming of mixed races by inter-

marriage." These races, Tylor believes, have descended from a common ancestry, however distinct, while the different races, such as the black, brown, yellow and white, "are living records of the remote past, every Chinese and Negro bearing in his face evidence of the antiquity of man." So the study of philology shows that one family of languages, now spoken in Asia and Europe has descended from a common ancestral language, which is now theoretically called the Aryan, though "of an original primitive language, the most patient research has found no traces." Also when we consider the arts and customs of mankind, "it appears, says our author, "that whenever there are found elaborate arts, abstract knowledge, complex institutions, these are the results of gradual development from an earlier, simpler and ruder

FIG. 1.—South Australian (Man).

state of life. No stage of civilization comes into existence spontaneously, but grows or is developed out of the stage before it. This is the great principle which every scholar must lay firm hold of, if he intends to understand either the world he lives in or the history of the past."

After sketching what history, archæology and geology teach as to man's age and course on the earth, he considers man's place in the animal world, and maintains that man's intellectual development "must have been in no small degree gained by the use of his hands."

As to the distinctions between man and the apes, Tylor remarks that "whereas the lobes of the ape's brain has fewer and simpler convolutions than in the human brain," as regards the

the latter, "both size and complexity mean mind-power." He then attempts to answer the question, How far do their minds work like ours? and falls back on the power of speech as giving "about the clearest distinction that can be drawn between the action of mind in beast and man," and he thinks it safe to conclude that the "mental machinery of the lower animals is roughly similar to our own, up to a limit."

The author then discusses the races of mankind, and states what a race is. Perhaps the lowest are the Australian (Figs. 1, 2,) and also the Andaman islanders (Fig. 3), the latter thought, by Flower, to be a remnant of a very early human stock, perhaps the best representative of the primitive Negro type. Tylor regards the native American, from the Arctic regions to Patagonia, as constituting

FIG. 2.—South Australian (Woman).

a single race. He thinks it "probable that man had appeared there, as in the old world, in an earlier geological period than the present, so that the first kinship between the Mongols and the North American Indians may go back to a time when there was no ocean between them. What looks like later communication between the two continents is, that the stunted Eskimo, with their narrow roof-topped skulls, may be a branch of the Japanese stock, while there are signs of the comparatively civilized Mexicans and Peruvians having in some way received arts and ideas from Asiatic nations."

In the chapter on language; sign-writing, gesture language, sound-gestures or interjections, are regarded as steps leading to the origin of language, which form what Tylor calls natural lan-

guage, which may be used by peoples of different spoken languages. As to the origin of language, it was not, in the author's view, "an event which took place long ago once for all, and then ceased entirely." "So far as language can be traced to its actual source, that source does not lie in some lost gifts or powers of man, but in a state of mind still acting, and not above the level of children and savages."

The act of writing is traced from the pictures of savage hunters to Egyptian hieroglyphics or pictures used to represent the sound of their name, then to the breaking down of the picture into a mere sound-sign, till the Phœnician alphabet arose from the Egyptian

FIG. 3.—Andaman Islanders.[1]

hieratic and the Greek alphabet from the Phœnician, which came down to us through the Romans. Then the origin of the arts of life, of pleasure, of the sciences, is discussed in a most suggestive way, and finally the notions of mankind concerning the spirit world, the origin of history and mythology, and lastly the origin of society. The author concludes "that the study of man and civilization is not only a matter of scientific interest, but at once passes into the practical business of life. We have in it the means of understanding our own lives and our place in the world, vaguely and imperfectly it is true, but at any rate more clearly than any former generation. The knowledge of man's course of

[1] The three wood-cuts kindly loaned by the publishers will give an idea of the excellence of the illustrations.

life, from the remote past to the present, will not only help us to forecast the future, but may guide us in our duty of leaving the world better than we found it."

Here our exposition of this able work must end; anthropologists may not agree with all of the author's conclusions; the science is in its infancy, and its center of gravity is not yet settled, but it must prove an invaluable manual of the subject. Few errors appear in it; a rather startling one is the author's statement on p. 30, that the musk ox "may still be hunted in the Rocky mountains with the grizzly bear." This is an evident slip of the pen.

KNOWLEDGE[1].—Under this title comes to us the first number of a popular scientific magazine. We welcome as many such journals as there is room for; whether there is for this one, time will show. Judging from the first number, "*Knowledge*," will be more than usually popular. We can anticipate that the department of astronomy will be very well conducted. There are several valuable articles, *e. g.*, "On science and Religion," by the editor, of a mediatory character, and one on The Relation of Food to Muscular Work, by Dr. Carpenter; also one on Illusions, by Thomas Foster, and a review of Darwin on Earth Worms. Of less value is a review of Delaunay's paper on the relative characteristics of men and women, which from the style of its logic, appears to have been written by one of the sex it seeks to defend from Dr. Delaunay's definitions. We hope for *Knowledge* a large share of usefulness and patronage.

RECENT BOOKS AND PAMPHLETS.—Notes on Sciomyzidæ with descriptions of new species. By Dr. L. T. Day, New Haven, Conn. From the Canadian Entomologist, Vol. XIII, No. 5, pp. 85–89. From the author.

List of N. American Sarcophagidæ, examined by R. H. Meade, Esq., Bradford, England. By Dr. H. A. Hagen, Cambridge, Mass. From the Canadian Entomologist, Vol. XIII, 1881, pp. 146–150. From the author.

On Simulium. By Dr. H. A. Hagen, Cambridge, Mass. From the Canadian Entomologist, Vol. XIII, 1881, pp. 150–151. From the author.

Revision du Groupe des Cydnides de la famille des Pentatomides. 1re partie. Par M. Victor Signoret. From the Annales de la Société Entomologique de France, 1881, pp. 25–32, tab. 2. From the author.

Revision of the species of Polyphylla of the United States. By George H. Horn, M.D. From Transactions American Entomological Society, Vol. IX, 1881, pp. 73–76. From the author.

Die Stegocephalen (Labyrinthodonten) aus dem Rothliegenden des Plauerischen Grundes bei Dresden. Von Herman Credner, in Leipzig. I Theil. 1 Einleitung. 2 Branchiosaurus gracilis Cred. (Tafel XV bis XVIII. 8vo, pp. 32, 3 quarto plates, col.) Berlin, 1881.

On the Petrel called Thalassidroma nereis by Gould, and its affinities. By W. A. Forbes, B.A., F.L.S., F.G.S., Prosector to the Zoological Society. 8vo, pp. 3. Extract from the Proceedings of the Zoological Society of London, June 21, 1881. London, 1881. From the author.

[1] *Knowledge*.—An Illustrated Magazine of Science. Plainly worded, exactly described. Conducted by R. A. PROCTER, B.A. Wyman & Sons, 745 Great Queen Street, London,

Notes on the anatomy and systematic position of the Jacanas (Parridæ). By W. A. Forbes, B.A., Prosector to the Society. 8vo, pp. 10, cuts. Extract from the Proceedings of the Zoological Society of London, May 17, 1881. From the author.

The Pipes of all Peoples. By William Bragge. 8vo, pp. 16. Reprint from the Binghampton Daily Post, Dec. 16, 1870. Binghampton, 1880. From E. A. Barber.

Science and Art Department, Edinburgh Museum of Science and Art. Guide to the Loan Collection of objects connected with the use of tobacco and other narcotics. 8vo, pp. 20. Edinburgh, 1880. From E. A. Barber.

The Bragge Collection. Reprint from "Cope's Tobacco Plant." December, 1880. 4to, pp. 4. Liverpool, 1880.

On the Conformation of the thoracic end of the Trachea in the "Ratitate" Birds. By W. A. Forbes, B.A., F.L.S., Prosector to the Society. 8vo, pp. 12. cuts. Extract from the Proceedings of the Zoological Society of London, June 21, 1881. London, 1881. From the author.

Osteology of the North American Tetraonidæ. By Dr. R. W. Schufeldt, U.S.A. 8vo, pp. 40, 8 plates. Department of the Interior, United States Geological and Geographical Survey. Extract from the Bulletin of the Survey, Vol. VI, No. 2. Washington, Sept. 19, 1881. From the author.

Osteology of Lanieu's Ludovicanus excubitoroides. By R. W. Schufeldt, M.D., First Lieut. Med. Dept. U. S. Army. 8vo, pp. 16, 1 plate. Department of the Interior, United States Geological and Geographical Survey. Extract from Bulletin VI, No. 2. Washington 1881. From the author.

Observations upon the Hippopotamus. By Henry C. Chapman, M.D. 8vo, pp. 24, 4 plates, cuts. Extract from the Proceedings of the Academy of Natural Sciences of Philadelphia. Philadelphia, 1881. From the author.

Problems in Entomology. An address by Samuel H. Scudder before the Entomological Club (afterwards the sub-section of Entomology) of the American Association for the Advancement of Science, Boston meeting, August 24, 1880 8vo, pp. 10. Salem, 1881. From the author.

The Tertiary Lake Basin of Florissant, Colorado. By Samuel H. Scudder. 8vo, pp. 20, map. Department of the Interior, United States Geological and Geographical Survey. Washington, 1881. From the author.

Report of Professor Spencer F. Baird, Secretary of the Smithsonian Institution, for the year 1880. 8vo, pp. 84. Government Printing Office, Washington, 1881. From the author.

General Index and Supplement to Nine Reports on the Insects of Missouri. By Charles V. Riley, M.A., Ph.D. 8vo, pp. 178. Department of the Interior, United States Entomological Commission, Bulletin No. 6. Government Printing Office.

Chinch Bug, its history, character and habits, and means of destroying it or counteracting its injuries. By Cyrus Thomas, Ph.D. 8vo, pp. 44, cuts. Department of the Interior, United States Entomological Commission, Bulletin No. 5. Government Printing Office, Washington, 1879. From the author.

The Hessian Fly, its ravages, habits, enemies, and means of preventing its increase. By A. S. Packard, Jr., M. D. 8vo, pp. 40, map. Department of the Interior, United States Entomological Commission. Bulletin No. 4. Government Printing Office, Washington, 1880. From the author.

First Annual Report of the United States Geological Survey, to the Hon. Carl Schurz, Secretary of the Interior. By Clarence King, Director. 4to, pp 80, map, bound. Government Printing Office, Washington, 1880. From author.

Bulletin of the United States Geological and Geographical Survey. Vol VI, No. 2. Department of the Interior. Government Printing Office, Washington, September 19, 1881. From the secretary.

Cassell's Natural History, parts, 56–57. 4to, pp. 40, 11 plates. Cuts. New York, 1881. From the editor (P. M. Duncan, M. D., F. R. S.).

Scolopendrella and its position in nature. By A. S. Packard, Jr. 8 vo. pp. 8. Extra. From the American Naturalist, September, 1881. Philadelphia, 1881. From the author.

Notes on the Early Larval Stages of the Fiddler Crab, and of Alpheus. By A. S. Packard, Jr. 8vo, pp. 10. Cuts. Extract from the American Naturalist, October. Philadelphia, 1881. From the author.

On a New Cray-Fish, from the Lower Tertiary of Western Wyoming. By A. S. Packard, Jr. 8vo, pp. 10. Cuts. Department of the Interior, United States Geological and Geographical Survey. Government Printing Office, Washington, September 19, 1881. From the author.

Annotated List of Birds of Nevada, by W. J. Hoffman M. D. 8vo, pp. 50. Department of the Interior, United States, Geological and Geographical Survey. Government Printing Office, Washington, 1881. From the author.

Günther's Literature and Morphography of Fishes. A review of Dr. Günther's introduction to the Study of Fishes. By Theodore Gill, M. A., M. D., Ph.D. 12mo, pp. 16. Extract from the "Forest and Stream," New York, 1881. From the author.

The New Botany. A Lecture on the best method of Teaching. By W. J. Beale, M. D., Ph.D. 8vo, pp. 16. From the Transactions of the Twenty-ninth annual Meeting of the Michigan State Teacher's Association, Lansing, 1881. From the author.

Mivart on the Cat, Review of by Prof. George Macloskie. 8vo, pp. 4. From the October number of the Presbyterian Review. New York, 1881. From the author.

The Journal (Formerly Archives) of Comparative Medicine and Surgery. A Quarterly Journal of the Anatomy, Pathology, and Therapeutics of the Lower Animals. New York, 1881. From the publishers.

Beiträge zu einer Kraniologie der europäischen Völker. Von Professor J. Kollmann, in Basel. 4to, pp. 120. 4 plates, colored, cuts. Aus dem "Archiv. für Anthropologie." Band XIII, tes 4. Braunschweig, 1881. From the author.

Essai sur Le Classement des Animaux qui vivent sur la Plage et dans environs de Dunkerque. Troisiéme fascicule. Par M. O. Terquem, ancien Pharmacien. 8vo, pp. 54. 5 plates. 1881.

Photographs of remains of Batrachia of the Coal Measures of Nova Scotia. By J. W. Dawson. Montreal 1881.

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GENERAL NOTES.

BOTANY.[1]

DIMORPHISM IN BLACK MUSTARD.—It may not be generally known that there are two forms of flowers in the common mustard (*Brassica nigra*), which differ mainly in the length of the pistil. In the short-styled form, the top of the stigma does not quite reach to the bases of the higher anthers, and is about even with the tips of the lower ones. The long-styled has the stigma reaching to the middle of the higher anthers. The dimensions of the stamens are nearly identical in the two forms.

In each flower, they may be naturally divided into two sets, each set consisting of two long stamens and one short. Those of the same set face toward each other, that is, toward the nectary of the set, which is surrounded by them and the pistil. There are two nectaries, therefore in each flower, and on opposite sides of the pistil. Two advantages of this arrangement should be mentioned: first, the anthers near the pistil turn away from it, so that their pollen does not easily reach it, but rather the bill of the insect which reaches down to the nectary, and second, as the

[1]Edited by PROF. C. E. BESSEY, Ames, Iowa.

insect passes from one nectary to the other, its bill is likely to carry pollen to the stigma.

As in other cases of dimorphism, all flowers on the same root have the same form. Much care should be taken in verifying this statement, for, as in both forms the pistil soon elongates, after the flower has passed its prime, it is easy to mistake older flowers of the short-styled form for long-styled ones. But comparing flowers which have just opened, or before they have been fertilized, the facts stated above will be clearly seen. The styles in the two forms differ in length a little less than one millimetre.

The dimorphism in this case seems to be imperfect. There are two lengths of stamens, and two lengths of pistils to correspond, but while the different pistils are distributed to different plants just as in Houstonia, Lithospermum, etc., the different stamens are not even distributed to different flowers. Moreover, the longer stamens are twice as numerous as the shorter. These facts suggest the following queries:

1. May we not have in this case two plans for cross-fertilization coëxisting, viz., one more or less analogous to other cases of heterostylism, and the other like that in the Rosaceæ, etc., where stamens and pistils are equally prominent, to profit by the haphazard movements of insects visiting the flowers?

2. Do similar relations exist, in all the Cruciferæ, or are these variations which indicate a transition stage in the development of dimorphism?

To direct observation and obtain an answer, especially to the latter question, has been one purpose in publishing the facts given above.—*J. E. Todd, Tabor, Iowa.*

Motion of the Fruit of Tilia while in the Air.—Every one is familiar with the singular inflorescence of the genus *Tilia*, in which the long peduncle, really axillary to the large papery bract, is so adnate to this for about half its length, as to appear to spring from its middle. Well known as are these lindens or limes, and especially the *Tilia Europæa*, I do not recall having seen any mention of the use that the plant makes of this scale in distributing its fruit. As the globular nuts ripen, the scale becomes more dry and papery. It also bends back upon itself from the point where the peduncle becomes free. It is weighted, as it were, by the fruit balls below. Sometimes moreover, there is a lateral twist to the wing, making it not unlike the fluke of a propeller. Now, when a breeze disengages this apparatus, it falls by its own weight, but, through the influence of the wing, at once begins to revolve rapidly upon its axis, looking like the governor of a steam-engine in rapid motion. I take it there is here a chance for mathematical research, but that is unfortunately out of my line. Will not some botanist of a mechanical turn, if such a being exists, study into this matter a little? I take it that the purpose of the apparatus is, as in the case of the ash, to propel the

fruit outside of the immediate radius of the tree. So like butterflies do these scale-borne nuts in the air appear, that I have been repeatedly deceived by them. It seems to me that the subject would reward the diligent study of one who combined good powers of observation with certain mathematical attainments.

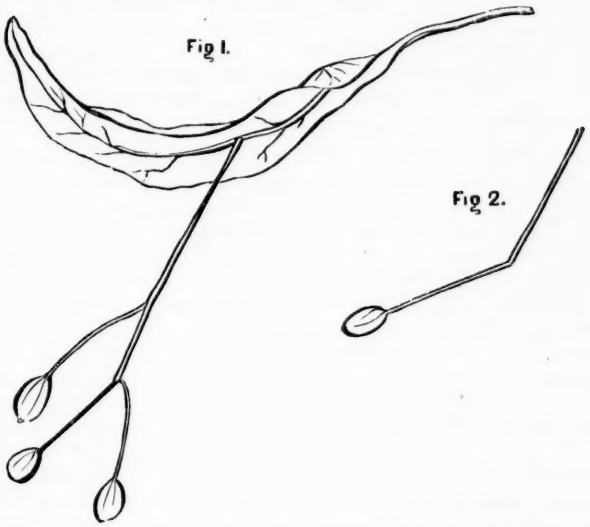

FIG. 1.—Bract, with its cluster of ripened nuts; FIG. 2.—A more frequent condition.

I would add that usually, the nuts more or less break off before the disarticulation of the scale from the tree, one or two only remaining, and these standing somewhat at right angles to the main peduncle. May not this throwing of the weight to one side, itself induce the revolution?—*W. W. Bailey, Brown University, Oct. 15, 1881.*

THE SENSITIVENESS OF TENDRILS.—Some years since, in order to measure the sensitiveness of the very fine and slender tendrils of *Cobœa scandens*, I placed one evening at seven o'clock, a human hair about two inches in length upon an expanded tendril. This was done with the greatest care, so as not to produce any other irritation than that due to the weight of the hair itself. Upon examination the next morning at seven o'clock, the tendril was found to have tightly clasped around the hair, and coiled itself into a tight knot. Every precaution had been taken to prevent interference with the experiment, so that it may be considered as certain that the contact of the hair was the exciting cause of the twining of the tendril.

THE SUPERABUNDANCE OF POLLEN IN INDIAN CORN.—Nature evidently intends to secure the fertilization of the young ovules in the Indian Corn (*Zea Mais*) beyond all chance of failure. In the autumn of 1875, I made a large number of careful counts and estimates which resulted in fixing upon twenty-five hundred as the average number of pollen grains in each anther. Each panicle of male flowers (the "tassel") was found by careful estimates, to contain about 7200 stamens, so that the number of pollen grains produced by each plant is about eighteen millions. Allowing two ears of one thousand kernels each, to each plant (a very high estimate), there are still nine thousand pollen grains for every ovule to be fertilized!

THE COMMON NAMES OF OUR PLANTS.—An effort is now making to collect and arrange the common names now borne by the plants of the United States, somewhat as has been done for English plants by Prior in his "Popular Names of British Plants," and Messrs. Britten and Holland, in the "Dictionary of English Plant Names." Whatever may be said against common names on account of their frequently objectionable form, their common application to several entirely different plants, besides other objectionable features, not to mention their little value to the practical botanist, it yet remains that plants are known to a very large portion of our people by common names only. We must confess to a rather kindly feeling for these popular names, in spite of their many faults and sometimes exasperating inconstancy and inconsistency, and so we hail, with delight the announcement made by W. R. Gerard, one of the editors of the *Torrey Bulletin*, of his intention to undertake to record the names under which the same plants are known in different parts of the country. As this is a movement in the right direction, undertaken by one eminently qualified to complete it, we have no hesitation in urging readers of the NATURALIST, to render aid "by collecting lists of the popular names by which our plants are known in their neighborhoods," and sending them to Mr. Gerard (9 Waverly Place, New York City), accompanied of course by the scientific equivalents. It is known that many of the so-called common names given in the books are merely book-names, having no usage except in botanical classes in schools, and with those whose knowledge of plants is derived mainly from books; it is desirable that such be carefully distinguished from those in use by people who have no knowledge of the botany of the books. The names given to plants by the Indians, are also of interest, and should be preserved.

COREOPSIS ROSEA.—In Gray's Manual of Botany, *Coreopsis rosea* Nutt. is marked rare, and credited to Plymouth, Mass. It occurs abundantly on the sandy, wet shore of Waushakum pond, South Framingham, Mass., and it has also been found by Dr. E. A. Daniels, Medway, on the shores of Kingsbury's pond. The

receptacle is distinctly conical, and as my 1859 edition of Gray says, under the generic title, "receptacle flat," I must acknowledge the kindness of Dr. Daniels, in identifying the plant from Nuttall's description.—*E. Lewis Sturtevant, South Framingham, Mass., Oct. 19, 1881.*

CERATOPHYLLUM DEMERSUM IN FRUIT.—Gray, in his Manual, says that *Ceratophyllum demersum* L. is "common but rarely seen in fruit." I have to-day the pleasure of finding the plant in this somewhat uncommon condition.—*Dr. Alfred C. Stokes, Trenton, Aug. 30, 1881.*

BOTANICAL NOTES.—The opening address before the Geographical Section of the British Association for the Advancement of Science, was given this year, by Dr. J. D. Hooker. Very naturally the address was principally concerned with the geographical distribution of plants, which was reviewed historically.——T. R. A. Briggs calls attention, in the *Journal of Botany*, to the fact, that hybrids occur between some of the species of *Epilobium*, and describes one between *E. hirsutum* and *E. montanum*. Have our species been observed to hybridize?——De Bary is publishing in the current numbers of the *Botanische Zeitung*, an important paper, on the *Peronosporeæ*. If possible a summary will be given in these columns before long.——The "Catalogue of the Plants of Indiana," which has been publishing in parts as extra sheets in the *Botanical Gazette*, has appeared in pamphlet form. In all there are recorded 1432 species of flowering plants and vascular cryptogams. Valuable notes are appended to many of the species. The "characteristic forest trees are the poplar *(Liriodendron)*, maple, ash, elm, black and white walnuts, oak, hickory, beach, sycamore." The authors (Professors, J. M. and M. S. Coulter, and C. R. Barnes) further state in their preface that "the flora of the State is readily divided into four groups, each marked by the physical aspect of the region in which it is found; these regions may be called (1) 'the river valleys,' (2) 'the lake borders,' (3) 'the prairies,' and (4) 'the barrens'."——Brefeld's recent studies of Entomophthoræ, lead him to regard them as constituting a small family closely allied to the Ustilagineæ, or possibly through *Entyloma*, merging into the latter. As the Entomophthoræ are clearly oösporous in their sexual reproduction, Brefeld must consider the spores of Ustilagineæ as actually oospores, modified and degraded by excessive parasitism. This would bring the Peronosporeæ, Saprolegniaceæ, Entomopthoræ and Ustilagineæ into a series of allied orders, and would separate quite widely the last named order from the Uredineæ, heretofore usually associated with them.——The reviews of Pfeffer's new book on the Physiology of Plants *(Pflanzenphysiologie*, Ein Handbuch des Stoffwechsels und Kraftwechsels in der Pflanze. Band 1. Leipsig, 1881) indicate that when completed, it will be a most valuable acquisition to

the literature of this department of botany. Why cannot some of our publishers secure the translation of this work?——The late Professor Parlatore, before his death, had planned a work on the Comparative Anatomy of Aquatic Plants, which unfortunately was left unfinished. The fragmentary work consisting of nine fine plates showing figures of cross and longitudinal sections of different organs, together with explanatory text, has been published in Florence under the title of *Tavole per una "Anatomia della piante acquatiche."* Species of *Alisma, Callitriche, Ceratophyllum, Hippuris, Myriophyllum, Naïas, Nelumbium, Nuphar, Nymphæa, Potamogeton, Trapa, Vallisneria. Victoria,* and many other phanerogams, and of *Iseries, Marsilia* and *Pilularia* among vascular cryptogams, are included in the figures.——Dr. Karl Kraus' observations upon the flow of sap from cut surfaces of plants, promise when completed, to throw light upon the poorly understood subject of the movement of fluids in plants. The sieve tissue of the fibrovascular bundle appears to conduct fluids most abundantly, although other tissues can act as conductors, as the fibrous envelope of some bundles, and the immature tracheery tissue of others. Even collenchyma may serve as a conducting tissue. Mature vessels (tracheary) conduct no sap, and parenchyma does so only when sap is exceedingly abundant.

ZOÖLOGY.

THE CŒLOMA THEORY.—Since Haeckel's publication of his Gastræa theory, the most important generalization in embryology is the Cœloma theory of the brothers Hertwig.[1] It is an expression of the history of the nature and changes of the middle layer of the blastoderm.

They define two types of middle layer as follows: In the first, it is formed of separate cells which wander from the epiblast and hypoblast, which in some instances appear round the mouth of the gastrula. This they call the *mesenchym.* In the second type, the layer is divided as two strata of cells from the epiblast. To this form they restrict the name *mesoblast.* Moreover in the animals which present the mesenchym, there is a cavity between the epiblast and hypoblast, which is not the true body-cavity. Such are the Plathelminths (flat worms) Bryozoa and Mollusca. To this series they give the name of *Pseudocœlia.* The echinoderms, brachiopods, round worms, arthropods and vertebrates possess a mesoblast. Here the two layers of the mesoblast separate and form the walls of the body cavity, which is divided by the intestine into two chambers. To this division is given the name of the *Enterocœlia.* Animals are thus divided into two divisions, those in which the blastoderm consists of two layers, and those in which it is formed of four layers.

The consequences of these modes of origin are seen in charac-

[1] Jenaische Medicinische Zeitung. 1881.

teristic structures of the adult. Thus in the *Mollusca* the vessels of the circulatory system are diverticula of the general body-cavity with which they freely communicate. On the other hand the circulating vessels of the *Enterocœla* never communicate with the body-cavity, but originate from the digestive system, or independently. In the *Pseudocœlia* the nervous system is derived from the mesenchym, except perhaps the supraœsophageal ganglia of Mollusca. In the *Enterocœla*, on the other hand, the central system is developed from the epiblast, and the peripheral system from the epiblast and external layer of the mesoblast.

THE TORTOISES OF TUCSON.—There are two land tortoises and a fresh-water turtle found here that are not given in the list of reptiles for Southern California, by Dunn and Fisher, published in the April number of AMERICAN NATURALIST.

One of the terrestrial tortoises[1] resembles at first glance the common box tortoises, *Cistudo virginiana*, but differs in the ornamentation of the plates on the carapax and on the sternum. The whole exoskeleton is marked with brown and yellow stripes and spots; brown predominating on the carapax and yellow on the sternum.

The only specimen in my possession I found crossing the road seventy miles south of Tucson, in Pima county, Arizona, some distance from permanent water. My specimen is five and a-half inches long, four inches broad and two and three-quarters inches high.

The other land tortoise is a large animal.[2] This fellow is found on the basaltic mountains in the most arid parts of this dry country. He is a vegetarian, feeding, as I am told, on cacti. His flesh is highly esteemed as food by the Indians and Mexicans. You will perceive that his mandibles are notched or toothed. His legs are covered with bony scales, and his front toe nails are made long and strong for digging amongst the rocks, while the hind feet are round like an elephant's.

When molested he draws in his head and closes the aperture with his legs by bringing the knees together in front of the head; the hind legs are also drawn in until the posterior spaces are closed by the feet, and in this way all vulnerable parts are protected by impenetrable armor. In preparing the specimen, I found on each side, between the flesh and carapax, a large membranous sack filled with clear water; I judged that about a pint run out, though the animal had been some days in captivity and without water before coming into my possession. Here then is the secret of his living in such a dry region; he carries his supply of water in two tanks. The thirsty traveler, falling in with one of these tortoises and aware of this fact, need have no fear of dying for immediate want of water.

[1] *Cistudo ornata* Agass.
[2] *Xerobates agassizi* Cooper.

The fresh-water turtle[1] is found in the Santa Cruz river at Tucson. This is a small stream about twenty feet wide at low water; it rises in Arizona, on the east side of Patagonia mountains, flows southerly into Sonora, Mexico, then turns northward and again enters Arizona between the Santa Rita and Oro Blanco mountains. The water sinks beneath the surface for the greater part of its course, except in the rainy season, and is only a flowing stream for a short distance at this place, and is supposed to empty into the Gila river, near Maricopa wells.—*E. T. Cox.*

Intelligence of a Cat—Several years ago my grandfather moved from his farm into this city. Among the domestic animals on the place at that time was an old cat with one small kitten. These they intended to leave, placing the kitten in a room where a broken pane of glass would allow the cat to pass back and forth at will. The last load was nearly ready to start, when my father, who was making some final preparations, was attracted by an exclamation of surprise from his mother, and looking around he beheld the cat strutting along with the kitten dangling from her mouth. Without any interference on the part of the ladies, who were on the wagon, or by any member of the family, she marched directly to the load, and after surveying it a moment, jumped upon it, where, after a short search, she chose an inverted table and placed her charge in it. It is, perhaps, unnecessary to add that she was not left at the farm.

This story has a double charm for me. In the first place I know it to be true; secondly, it shows remarkable intelligence in the subject of it. We all know how watchful a cat is of her kittens and how eager she is to carry them back when removed from their bed, so it seems altogether out of the usual course when one, of her own accord, removes, as this one did, knowing undoubtedly that they were to be taken away.—*N. H. Hurd.*

Migration of Birds.—One of the most interesting reports presented to the last meeting of the British Association, was that of the committee on the migration of birds. Observations have been received from 103 lighthouses and lightships, which show that the migration of one species of birds or another is almost continually going on; but the great migrations are in the autumn and spring. From the facts gathered at lighthouses and lightships, it appears certain that many thousands of birds must perish at sea. The white fixed lights attract the greater number of birds, the mortality at Skerryvore for October, 1877, amounting to no fewer than 600, chiefly, the common thrush and the ring-ousel. Revolving lights are also fatally attractive, for at the Casquets, during the four hours from 11 P. M. to 3 A. M., October 7, with the wind S.S.E. and rain, land-rails, water-rails, woodcocks, ring-ousels, song

[1] A species of Cinosternum.—*Ed.*

thrushes, and swallows, were seen around the light, and of these there struck the glass and killed themselves, one land-rail, one water-rail, four ring-ousels, and no fewer than 100 swallows. The larger birds do not often strike the glass in the revolving lights, but follow the rays. So far the observations show that all birds, with few exceptions, are migatory—even sparrows, which invariably leave Heligoland before the end of September.

SUDDEN INTEREST IN JAPANESE ORNITHOLOGY.—In the report of some difficulties encountered by a well known library in New York, in their efforts to meet the public taste, we find a reference to an ornithological work which is as new to us as the reported interest in that science is surprising. The *Herald* says:

"President P. said that the management has spent three dollars for standard works to every dollar that has been expended on novels. The demand for the 'Birds of Japan' was so great that the directors had to buy sixty copies; and for other costly works the demand exceeded the directors' ability."

Perhaps one of the readers of "Unbeaten Tracks" may give us the means of properly classifying the ornithological specimen referred to.—*W. H. Dall.*

ASILUS AND LIBELLULA.—So far as I am aware, robber-flies are not credited with capturing prey larger than themselves. But last August my attention was attracted, one day, by a medium sized dragon-fly fluttering on the ground, and looking closely I saw a robber-fly, about three-fourths of an inch in length, quietly clinging to his body just under the right fore-wing, and sucking his blood. Haste forbade my waiting for the end of the struggle, but the issue was not uncertain.—*J. E. Todd, Tabor College, Iowa.*

TERNS AS FLY-CATCHERS.—Last August, near Fort Sisseton, D. T., I noticed many black gulls *(Hydrocheilodon lariformis)* in the air catching dragon-flies. They appeared to catch them by their tails, and after several pinches with the bill, with a raise of the head they gulped them down. All this was done very gracefully, while they were on the wing.—*J. E. Todd.*

SPECIMENS OF MELANTHO WANTED.—Sets of from five to ten specimens each, of all the species of the genus Melantho, from every available locality. Please correspond with R. Ellsworth Call, 1722½ Woodland avenue, Des Moines, Iowa. Liberal exchanges will be given in Strepomatidæ or Unionidæ. Material is wanted *at once.* Any specimens with the animal either dried or in alcohol especially desired.

ZOOLOGICAL NOTES.—Some of the causes affecting the decrease in the number of our birds are discussed by Mr. H. W. Henshaw, in the Bulletin of the Nuttall Ornithological Club for October. Besides the effects of disease, accident, the attacks of other animals, which probably act as but a slight check in the increase

of birds, Mr. Henshaw mentions telegraph wires, and storms, the effects of which are pretty well known. Foggy and tempestuous weather, during which birds are dashed against lighthouses or are carried out to sea and drowned, cause widespread destruction among birds, and this occurs on the great lakes as well as on the ocean, and Mr Henshaw concludes that the "ocean's victims annually reach such figures as to affect the numerical relation of species over extensive areas."——In the same journal, Dr. Shufeldt records the discovery of a supposed new bone in the wing of a hawk *(Circus hudsonius)* which he calls the *os prominens*, but would not consider as a carpal bone.——A supposed new boring Annelid found injuring the iron wire of a submarine cable off Singapore, is described and figured by C. Stewart, in the Journal of the Royal Microscopical Society, for October.——The vinegar worm *(Anguillula aceti)* and its allies have been treated monographically, by Dr. L. Oerley; to show how little these animals need a special respiratory apparatus, a number of the vinegar worms were placed in a vessel and covered by a layer of oil an inch thick; after two months the greater number were still alive.—— The development of the liver fluke has been studied by Mr. A. P. Thomas, who states that the embryo can only develop at a temperature lower than that of the mammalian body. The number of eggs produced by a single fluke "may be safely estimated at several hundred thousand."——The sea-urchins are being, in part, revised by F. J. Bell, in the Proceedings of the Zoological Society of London.——The one-celled animals, or Infusoria, especially, have been examined by C. Robin, to see whether the notion of a cell is sufficient to include everything in both elementary anatomy and physiology, and thinks that one-celled organisms "possess other things than those which occur under the form of cells." For example, *Podophrya lyngbyei*, in the larval stage, is a good example of both an anatomical and physiological unit. But it is certain that by virtue of their peduncle, of their theca which is separable from it, and of the body, which is separable from the theca, the adults of Podophyra, and the Acinetæ, in general, are Protozoa in which are found at least two kinds of anatomical and physiological units, the one of these, namely the non-contractile theca and its peduncle, is subordinate to the others, the sarcode body, and it remains essentially different from it in anatomical and physiological characters.——A very full account of the Protozoa inhabiting man is given by Leuckart, in the second edition of his work on human parasites. He regards the psorosperms as constituting a new class, which he calls *Sporozoa*. Grassi, in an Italian journal, also enumerates the Protozoa found by him, chiefly in man. The list is sufficiently formidable.——Mr. Darwin's book on the earth-worm, shows what a vast work is done by worms in altering vegetable into what he calls "animal mould." He also shows that worms are sensitive to light, to vibrations of any solid object

with which they may be in contact, that they can smell natural food, have a sense of taste for food, but that the sense of touch is most highly developed. Worms are omnivorous, eating meat as well as leaves. How great quantities of leaves they drag under the ground, and how they undermine stones, and triturate in their stomachs small particles of stone, and thus act as geological agents is shown in this remarkable book.

ENTOMOLOGY.[1]

RETARDED DEVELOPMENT IN INSECTS.[2] — In this paper the author records several interesting cases of retarded development in insects, whether as summer coma or dormancy of a certain portion of a given brood of caterpillars, the belated issuing of certain imagines from the pupa or the deferred hatching of eggs. One of the most remarkable cases of this last to which he calls attention, is the hatching this year of the eggs of the Rocky Mountain locust, or western grasshopper *(Caloptenus spretus)* that were laid, in 1876, around the Agricultural College at Manhattan, Kans. These eggs were buried some ten inches below the surface in the fall of 1876, in grading the ground around the chemical laboratory. The superincumbent material was clay, old mortar and bits of stone, and a plank sidewalk was laid above all. In removing and regrading the soil last spring, Mr. J. D. Graham noticed that the eggs looked sound and fresh, and they readily hatched upon exposure to normal influences, the species being determined by Professor Riley from specimens submitted by Mr. Graham. Remarkable as the facts are, there can be no question as to their accuracy, so that the eggs actually remained unhatched during nearly four years and a half, or four years longer than is their wont, and this suggests the significant question: How much longer could the eggs of this species, under favoring conditions of dryness and reduced temperature, retain their vitality and power of hatching?

Putting all the facts together, Mr. Riley concludes that we are, as yet, unable to offer any very satisfactory explanation, based on experiment, of the causes which induce exceptional retardation in development among insects. It is a very general rule that a rising temperature stimulates and accelerates growth, while a falling temperature retards and torpifies, and experiments recorded by the author[3] show that such is the case with regard to the eggs of *Caloptenus spretus*. But there are many strange exceptions to the rule. The eggs of crustaceans, as Apus and Cypris, are known to have the power of resisting drouth for six, ten or more years without losing vitality, while in some

[1] This department is edited by PROF. C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., should be sent.

[2] Abstract of a paper read before the Entomological Section of the A. A. A. S. at Cincinnati.

[3] 9th Rep. Ins. Mo.; also 1st Rep. U. S. Ent. Com.

cases they seem actually to require a certain amount of desiccation before they will hatch. Yet the fact remains that different species act differently in this respect. In short, nothing is more patent to the observing naturalist than that species, and even individuals of the same species, or the progeny of one and the same individual act very differently under like external conditions of existence; or in other words, that temperature, moisture, food, etc., influence them differently. Hence—as has been shown by Semper to be the case with other animals, so it is with insects—changes in the external conditions of existence will not affect the fauna as a whole equally, but will act on individuals. We can understand how this great latitude in susceptibility to like conditions may and does in the case of exceptional seasons prove beneficial to the species by preserving the exceptional individuals that display the power to resist the unusual change, but we shall find ourselves baffled when we come to seek a demonstrable explanation of the cause or causes of such retardation, while the principles of evolution afford us the only hypothetical one at all satisfactory.

In the innate property of organism to vary and in the complex phenomena of heredity, we get a glimpse at the cause—a partial explanation—of the facts of retarded development, for the exceptional tendency in the present may be looked upon as a manifestation, through atavism, of traits which in the past had been more commonly possessed and more essential to the species. This hypothesis is strengthened by the fact that the period of two, three or more years occupied in full development by exceptional individuals of a species which normally goes through its transformations within one year, is at the present day the normal period in other species belonging to the same natural order.

PREPARATION OF DIPTERA.—Prof. Joseph Mik, of Vienna,has, in the *Verhandlungen der K. K. zoologisch-botanischen gesellschaft in Wien* for 1880 (reprinted in Katter's Entomologische Nachrichten, 1881, pp. 189–206) an elaborate article on the Preparation of Diptera for cabinets, and we recommend a perusal of it to our dipterists, whether beginners or advanced students. It is evident from the paper that the proper preparation of Diptera for a cabinet, so as to render the specimens fit for scientific determination and study, requires more care and delicate manipulation than in any other order of insects. It is an art which can only be acquired by long practice, and we are glad that Professor Mik gives us the benefit of his life-long experience.

THE PERMANENT SUBSECTION OF ENTOMOLOGY AT THE RECENT MEETING OF THE A. A. A. S.[1]—Mr. Lintner's paper "on a remarkable invasion of Northern New York, by a Pyralid insect," gave a full and detailed account of the occurrence, to an injurious ex-

[1] Concluded from p. 902.

tent, in various counties of New York, of the larva of *Crambus vulgivagellus*, reciting the facts that have already appeared in our columns, in reference to this species and *Nephelodes violans*, but giving, in addition, very careful records of observations as to the habits of the former. On an island on the Roquette river, which had been absolutely denuded of grass, the worms had so thickly congregated under the shade of a solitary oak tree, that its base for about 18 inches was covered with a fine layer of silken web. The worms had evidently been forced, from sheer lack of food and shade, to migrate, and they naturally congregated under the first shade in their way, constantly spinning, as is their nature, until the compact web was formed. The term "invasion" as applied to the exceptional increase of this species seems to us unfortunate and to convey a wrong impression.

Mr. Edwards's paper "on an alleged abnormal peculiarity in the history of *Argynnis myrina*," gave a number of facts from his own observations, which go to show that the history of this species, as well as that of *bellona*, as related by Mr. Scudder, in his recent work, was quite incorrect.

Mr. Cook, in his paper "on carbolic acid as a preventive of insect ravages," gave his experience with carbolic acid as an insecticide. By mixing two quarts of soft soap with two gallons of water, and adding one pint of carbolic acid in the crude state, and then diluting one part of this mixture to fifty parts of water, he found that he could protect his radishes from maggots, the flies being thereby kept away from them. He made the application once a week. He also found carbolic acid a good substitute for soft soap in protecting his apple orchard from borers. He gave further experiments to show the value of London purple as a preventive of the work of the apple-worm. In the discussion of this paper, Mr. Riley expressed his belief in the efficacy of London purple, for this purpose, but objected, on general principles, to its use on fruits, and particularly on the more mature apples as against the second brood of worms. He believed that knowledge of its use, would prejudice purchasers. Mr. Claypole coincided with these view. Mr. Cook argued that the danger was more imaginary than real, and cited several cases, where it had been extensively used with great benefit, and no ill results.

Mr. Claypole's paper on *Sericoris instrutana*, gave an interesting experience with the insect, showing how its larva destroys the leaf stem of the buckeye. In the vicinity of Yellow Springs, Ohio, it is a common annual occurrence that shortly after the leaves of the buckeye *(Æsculus glabra)* have unfolded in the spring, many of the leaves begin to droop and wither, and become conspicuous enough to catch the eye of ordinary observers. This results from the work of the larva of the Sericoris, which after burrowing in the leaf-stem lives in the faded and rolled-up leaf. Mr. Claypole's observations indicate but one annual brood, as no

trace of injury is observable after the beginning of May. The work of this insect is exactly like that of *Proteoteras æsculana* Riley, on maple and buckeye, but as Mr. Claypole's specimens were determined by Professor Fernald, there can be no doubt about the species, notwithstanding *instrutana* is known to feed also on clover. The food-habit in the species is thus as diverse as it is, for instance, in *Psylla tripunctata* (in Homoptera), which breeds alike on the tips of Pinus and in the crimped leaves of Rubus.

In his paper on Syrian bees, Mr. Cook told how D. A. Jones, of Canada, and Frank Benton, of Michigan, went to Europe in search of new varieties of bees. They brought from Larnaca, Cyprus, both the Cyprian bee and the Syrian bee, and Mr. Benton went to Ceylon and Java, in search of other varieties. From the former place he brought two new species, *Apis dorsata* and *A. floreæ*, the former making immense combs exposed to the underside of branches, the latter a delicate and beautiful comb in the hollows of trees and rocks. In Java he failed to find "the great Java bee." With the Syrian bee, Mr. Cook has Syrianized the apiaries of the Michigan Agricultural College. The Syrians are of yellow type, closely allied to the Italian bee, which latter is probably a modified offspring of the Cyprians, which, in their turn, are also probable descendants of the Syrians. The Syrian bees are indefatigable workers, no matter what the clime to which they are exposed, or the season of the year. They are more irritable than other bees, especially when queenless, but Mr. Cook believes they are a great acquisition to American apiculture.

Mr. Mann's communication on "suggestions of coöperations in furthering the study of entomology," contained some remarks suggestive of the title and urging the foundation of libraries and indices to the contents of periodicals and society transactions, but was mainly a plea for the support of the Cambridge Entomological Club, and the organ of the club, *Psyche*. He set forth one aim of the club, which is worthy of commendation. Recognizing the difficulty which numerous students, and intending students of entomology in this country, find in purchasing for their own use the books they need, the club has decided to make of its library, as far as practicable, a national loan library of entomology, for which members of the club, and other persons showing a sufficient interest in entomology, should be entitled to borrow books, at the least possible cost to themselves. The effective carrying out of this plan, has, thus far, been greatly hampered by the very limited resources at the disposal of the club, and it was for assistance that the speaker made his appeal. If the *Psyche* drags, or fails to fulfill its original mission, the cause may be found in the fact, that since it was started, much more thorough bibliographic serials, like the *Zoologische Anzeiger* and *Zoologische Jahresbericht* have appeared. It is certainly not for want of zeal on Mr.

Mann's part. He severely (and in our opinion, unjustly) criticized the managers of the American Entomological Society in Philadelphia, but we fear that no amount of criticism of other institutions, will make of the Cambridge Club the national institution Mr. Mann would desire, for the elements of nationality have so far been lacking.

Mr. Cook's paper entitled "How the Bee extends its tongue" was an illustration by means of diagrams of the manner in which the mouth-parts are first straightened by muscular action, and the ligula then protruded by the injection of liquids from ramose glands situated in the head and thorax.

Of Mr. Riley's papers, an abstract is given in this number of that on retarded development, and we hope to give abstracts of the others shortly.

ANOTHER HERBIVOROUS GROUND-BEETLE.—Complaint is made in Californian agricultural papers of the damage done to strawberry plants by a Carabid beetle. The beetle has been determined, by Mr. J. J. Rivers, curator of the University Museum, Berkeley, Cal., as *Anisodactylus confusus*. If this determination and the observations be correct, we shall have to add another Carabid to the list of species injurious to vegetation. We may remark here, by the way, that already in the Agricultural Report for 1868, Professor Glover records that *Harpalus caliginosus* had been taken in great numbers under wheat stacks in Maryland, and in open fields on timothy grass apparently feeding on the seeds.

A DISASTROUS SHEEP PARASITE.—Reports come to us of great injury to flocks in parts of Illinois by a parasite that is new to sheep raisers in that region. We have not yet seen specimens, but from the accounts and descriptions given, it is evidently what is known as the red-headed sheep louse *(Trichodectes ovis)*. Mr. Daniel Kelly, of Wheaton, Illinois, an old time correspondent, found that by dipping the sheep in a wash made by Little's Chemical Dip, the animals were freed from the pest.

PHYLLOXERA NOT AT THE CAPE.—The commission appointed to inquire into vine diseases have concluded their labors and embodied their researches in a valuable and voluminous report. The commission are, however, anxious to say that their work is not yet completed, and that the present report is published mainly to satisfy the public mind on the question of the Phylloxera. Having heard positively that the Phylloxera existed on certain farms, the commission at once visited those places, and after painstaking examination have come to the conclusion that this disease does not exist in any of the places stated to contain it, nor have they discovered it on any of the farms they visited. In order to confirm their judgment they sent home through the instrumentality of the Government, specimens of rootlets, leaves and parts of the vines to Dr. Cornu, who is admittedly the first

authority on the subject in Europe, and his opinion confirms the views of the commission in the amplest manner. Dr. Cornu says: "I made the most minute and careful survey of the vines said to be so affected, and came to the decided conviction that the Phylloxera did not exist on the vines in question."—*Eastern Province Herald, Port Elizabeth, Cape of Good Hope.*

RESISTANCE OF GRAPE-VINES TO PHYLLOXERA IN SANDY SOIL.—The immunity from the attacks of Phylloxera enjoyed by grape-vines when planted in sandy soil has long been known, and has been attributed to various causes. M. Saint-André, of Montpellier, France, discusses this subject in the *Messager Agricole* for May 10, 1881, and believes that neither the mobility nor the angulosity of the particles of sand, nor the absence of cavities, nor the chemical composition of sandy soil are sufficient reasons. Nor is the presence of a subterranean current of water in sandy soil an admissible reason, since it has been proven that the quantity of water contained in such soils at different depths and at different seasons is always smaller than that contained at the same period in other soils where the presence of Phylloxera renders the culture of the grape-vine impossible. He believes, however, that the circulation of water in the soil is a matter of the first importance in regard to the presence of Phylloxera, and that there exists a close relation between the resisting power of the vines and the capillary capacity of the soil. By this latter term he means the quantity of water which can be mechanically retained by a soil completely saturated with it. Where this capillary capacity of the soil is very small, the grape-vine enjoys absolute immunity from Phylloxera attacks; the more it increases the more the plants suffer. Sandy soil was found to possess the smallest capillary capacity, varying from 23 to 35.80 per cent., and in such soil the grape-vines are not only never attacked by Phylloxera, but the insect even disappears from infested plants when these are transplanted to such soils. Where the capillary capacity is above 40 per cent., the vineyards in France are rapidly disappearing under the attacks of the insect. Between the two limits above given, the plants suffer more or less. Exact figures cannot be given, as much depends on the resisting power of the different varieties of grape-vines and on the mode of cultivation. American resisting vines can be successfully cultivated in soils the capillary capacity of which attains, and even surpasses 45 per cent. Whether the diminished capillary capacity has a direct influence on the vitality of the Phylloxera, or whether through it the roots of the plant are enabled to resist the attack of the insect, is at present undecided.

While there is some plausibility in the theory advanced by M. Saint-André, we believe there are sufficient reasons to account for the diminished virulency of Phylloxera in sandy soil in its mechanical action upon the insect. Our own experiments with both

Phylloxera and many other insects in sand, prove conclusively that it is more difficult for such small, soft-bodied insects to make headway or to exist in sandy soil, not only because of the mechanical action of the particles adhering to all parts of the body, but because of the mobility of these particles and the absence of cracks, interstices and galleries which are formed in loamy or clayey soil, either by the penetration of roots, the effects of contraction during drought, or the action of the insects themselves.—*C. V. Riley in Farmers' Review.*

LOCUSTS IN THE WEST.—Mr. Uriah Bruner wrote us in September from the region of Denver, Colorado, that a few specimens of *Caloptenus spretus* were observed through that part of the country, but that they attracted no particular attention. The *Clifton* (Kansas) *Review* reports that they were seen flying southward over that town the last week of August, while other reports show that, just as we predicted would be the case, the pest was generally scarce in the West and did no damage. It was somewhat different on the Pacific coast. The Pacific migratory species *(Camnula pellucida)* was reported from Fresno as having been very thick on the plains and as doing much damage to vegetation about the middle of July, and we clip the following from the *Pacific Rural Press* of August 27th:

"For the past three years this section has been afflicted by the grasshoppers. As a consequence the farmers have lost all their crops and got heavily in debt. From affluence several have been reduced to poverty. Last year the pestiferous insects laid immense numbers of eggs—in fact the earth was alive with them, and the outlook was very bad for this year, and many did not plant, preferring to let their land lie idle rather than raise a crop of 'hoppers. This season they hatched out in full force, but for some reason they seem to have been panic stricken, and have winged their way in clouds across the Sierras toward California. Only a few are left behind and they can do no particular damage. This year's crop will be a fair one, while next year the harvest ought to be immense. The destination of the pilgrim plague is not yet announced, but the hope is strong that they will be caught in the mountain fastnesses and perish miserably. If our California friends find them pouncing upon their fields, they may expect to see desolation and ruin left in their track."—*Reno Journal.*

Locusts were also very destructive this year in many parts of South America, and we have had several requests from that quarter for the publications of the U. S. Entomological Commission. In Europe, judging from reports, Turkey seems to have been overrun by what is evidently the common *migratoria*, the whole population of Smyrna being employed to combat them. At Angora, report says, "all business was suspended for three days by order of the Governor General, and all the inhabitants were ordered to march out into the fields to destroy the grasshoppers. Every inhabitant was compelled to deliver twenty oka (about fifty-six pounds) of dead locusts to the officials." The swarms are said to emanate principally from Persia.

STRUCTURE OF THE CLAW IN PSOCINA.—Dr. H. A. Hagen has, in *Psyche* for April, 1881, the first part of a paper entitled "Some

Psocina of the United States," in which he calls attention to the curious structure of the claws possessed by many Psocina. The basis of the claw is enlarged beneath in the manner of a blunt projection with what appear to be two strong bristles of unequal length. Under a strong magnifying power it appears, however, that the longer of these bristles is in reality a kind of hose or funnel, open at tip and finely striate. In a few instances Dr. Hagen observed in the interior of the funnel a large number of very fine threads ending in a little knob. The functional character of this structure remains unexplained.

INSECT COLLECTION FOR SALE.—The collection of Coleoptera of the late Mr. C. Trabant of New Orleans, who was a zealous and careful collector and student of insects, is offered for sale by his widow. We are informed that this collection consists of nearly 10,000 specimens, representing about 2000 species, and, from a sample box sent us, we can attest that the specimens are in fair condition and that the collection is well worth the low price ($200) asked for it, and which includes the cabinet. The whole cabinet consists of 40 large drawers, 26 of which are filled with North American beetles (chiefly from Louisiana, Mississippi and Texas), and 10 with Coleoptera from Europe. For further particulars apply to H. D. Schmidt, M. D., 263½ Canal street, New Orleans, La.

ANTHROPOLOGY.[1]

PROFESSOR BAIRD'S REPORT FOR 1880.—Owing to the great strain on the Government Printing Office at Washington, matter prepared for the press is compelled to lie for months before publication. This is true of the Smithsonian Annual Report. The matter was ready for the printer six months ago, but we have just received the preliminary pamphlet, and shall have to wait some weeks yet for the bound volume. The portions especially valuable to anthropologists in Professsor Baird's Report, are Cushing's explorations among the Indians of the Zuñi Pueblo, Capt. Bendire's researches in the Northwest, Boehmer's index to Smithsonian Publications in archæology and ethnology, Vol. XXII of Contributions to Knowledge (containing Jones' "Explorations of the aboriginal remains of Tennessee;" Habel's "Sculptures of Santa Lucia Cosumalwhuapa in Guatemala;" Charles Rau's "Archæological collection of the United States National Museum;" Charles Rau's "Palenque Tablet," and W. H. Dall's "Remains of later prehistoric Man obtained from the caves in the Catharine archipelago"). Further notes will be found upon the antiquities of Antigua and Guadaloupe, and upon the Annual Report of 1879.

PEABODY MUSEUM OF AMERICAN ARCHÆOLOGY AND ETHNOLOGY.—The fourteenth annual report of this famous institution, marked

[1] Edited by Professor OTIS T. MASON, 1305 Q. street, N. W., Washington, D. C.

also Vol. III, No. 1, contains the reports of the curator, Professor F. W. Putnam, and that of the treasurer, together with a list of donations to the museum. In this notice the last shall be first. The authorities of the museum could do no wiser thing than to practice the most scrupulous care in giving credit to its benefactors. It is astonishing what an amount of hard work many individuals will perform merely to see their name in print in honorable connections. To put it in their language: "I want my children or my friends to see what I have done for science." In this matter of credit the Peabody is not only scrupulous, but is very wise in being so. The amount charged to the curator for the year's work is $11,295.44, which no doubt has been properly audited, though we have not much talent in detecting errors in that direction. The useful part of the report is the account of the year's work by the curator.

CHANGES IN MYA AND LUNATIA SINCE THE DEPOSITION OF THE NEW ENGLAND SHELL-HEAPS, by Edward S. Morse, before the A. A. A. S. in Cincinnati.—This communication embraced a comparison between the shells peculiar to the ancient deposits made by the Indians along the coast of New England and similar species living on the coast at the present time. He referred to similar comparisons which he had made in Japan, wherein he had found marked changes to have taken place; changes which showed that the proportions of the shells had greatly altered. He had made a large number of measurements of shells from a few shell heaps of Maine and Massachusetts, and had obtained very interesting results. The common clam (Mya) from the shell heaps of Goose island, Maine, Ipswich, Mass., and Marblehead, Mass., in comparison with recent forms of the same species, collected in the immediate vicinity of these ancient deposits, showed that the ancient specimens were higher in comparison with their length than the recent specimens.

A comparison of the common beach cockle (Lunatia) from the shell-heaps of Marblehead, Mass., showed that the present form had a more depressed spire than the recent form living on the shore to-day, and this variation was in accordance with observations he had made on a similar species in Japan.

ANCIENT JAPANESE BRONZE BELLS, by Edward S. Morse, *Ibid.*—Mr. Morse described the so-called Japanese bronze bells which are dug up in Japan. These bells had been described and figured by Professor Monroe, in the Proceedings of N. Y. Acad. of Sciences. Mr. Kanda, an eminent Japanese archæologist, had questioned their being bells, from their peculiar structure. Mr. Morse had seen a number of different kinds of bells, some of considerable antiquity, but none of them approaching these so-called bronze bells. Mr. Kanda had suggested that they were the ornaments which were formerly hung from the corners of pagoda roofs, but

the fact that none of them showed signs of wear at the point of support, rendered this supposition untenable. Mr. John Robinson, of Salem, the author of a work on Ferns, has given the first suggestion as to the possible use of these objects. He has asked why they may not have been covers to incense burners. Curiously enough old incense burners are dug up which have the same oval shape that a section of the bell shows. The bell has openings at the base and also at the sides and top, so that the smoke of burning incense might escape. It is quite evident that these objects are neither bells nor pagoda ornaments, and this suggestion of Mr. Robinson's may possibly lead to some clue regarding their origin.

Worked Shells in New England Shell-heaps, by Edw. S. Morse, *Ibid.*—Mr. Morse called attention to the fact that heretofore no worked shells had been discovered in the New England shell-heaps. A similar absence of worked shells had been noticed in the Japanese shell-heaps. Worked shells were not uncommon in the shell heaps of Florida and California. Mr. Morse then exhibited specimens of the large beach cockle (Lunatia) which showed unmistakable signs of having been worked. The work consisted in cutting out a portion of the outer whorl near the suture. To show that this portion could not be artificially broken, he exhibited naturally broken specimens of the same species, both recent and ancient, in which the fractures were entirely unlike the worked shells.

Congres et Missions Ethnographiques. — From Professor John T. Short, of Columbus, Ohio, we are in receipt of a circular stating the programme and list of delegates for the second session of this body to be held at Geneva, in 1882, on the 10th of April. The labors will be divided into seven sections:

I. Ethnogeny: Origin and migrations of races.

II. Ethnology: Development of nations by environment, geographic position, climate and aliment.

III. Descriptive ethnography: Distribution and classification of peoples, nations, and nationalities over the earth.

IV. Theoretic ethnography: The conditions of the development of nationalities.

V. Ethic. Manners and customs of nations.

VI. Political ethnography: The bases on which the existence of nations rests. Motives which have induced them to group themselves into great States, or to subdivide to secure the advantages of centralization.

VII. Ethnodicy. International law. The comparative study of legislations from an ethnographic point of view.

The delegates for our country are Professor John T. Short, of Columbus, Ohio, and Dr. Francis Parkman, Boston, Mass. Either of which gentlemen will be glad to furnish further information respecting the congress.

ITALIAN ANTHROPOLOGY.—Two original memoirs appear in the Archivio, Vol. XI, Fasc. 1:

Maestrelli, Dr.—The exponent of vital capacity.

Amadeè, Dr. Giuseppe—Numerical anomalies in the human dental system.

GEOLOGY AND PALÆONTOLOGY.

A NEW TYPE OF PERISSODACTYLA.—In a paper on the "homologies and origin of the molar teeth of the Mammalia Educabilia, published in March, 1874,[1] I ventured the generalization that the primitive types of the Ungulata would be discovered to be characterized by the possession of five-toed plantigrade feet, and tubercular teeth. No Perissodactyle or Artiodactyle mammal was known at that time to possess such feet, nor was any Perissodactyle known to possess tubercular teeth. Shortly after advancing the above hypothesis, I discovered the foot structure of *Coryphodon*, which is five-toed and plantigrade, but the teeth are not of the tubercular type. For this and allied genera, I defined a new order, the *Amblypoda*, and I have published the confident anticipation that genera would be discovered which should possess tubercular (bunodont) teeth. This prediction has not yet been realized. I now, however, record a discovery, which goes far towards satisfying the generalization first mentioned, and indicates that the realization of the prophecy respecting the *Amblypoda*, is only a question of time.

In 1873,[2] I described from teeth alone, a genus under the name of *Phenacodus*, and although a good many specimens of the dentition have come into my possession since that date, I have never been able to assign the genus its true position in the mammalian class. The teeth resemble those of suilline Ungulates, but I have never had sufficient evidence to permit its reference to that group. Allied genera recently discovered by me, have been stated to have a hog-like dentition, but that their position could not be determined until the structure of the feet shall have been ascertained.

In his recent explorations in the Wasatch Eocene of Wyoming, Mr. J. L. Wortman was fortunate enough to discover a nearly entire skeleton of a *Phenacodus* very near the typical *P. primævus*, which presents all the characters essential to a full determination of its place in the system. The unexpected result is, that this genus must be referred to the order *Perissodactyla*, and that, with its allies, it must form a special division of that order corresponding in the tubercular characters of its teeth with the bunodont or suilline division of the *Artiodactyla*. In this character, however, there is a closer gradation than in the case of the *Artiodactyla*,

[1] Journal of the Academy of Natural Sciences Philadelphia.

[2] Palæontological Bulletin No. 17, Oct., 1873, p. 3; also, Report G. M. Wheeler, U. S. Engineers Expl. W. 100 Mer., iv, p. 174—1877.

and it would scarcely be necessary to create such a group on that character alone. But the genus differs further from the *Perissodactyla* and approaches the *Proboscidia*, in the fact that the astragalus articulates with the navicular only, and by a universally convex surface, as in the Carnivora.

The astragalus resembles that of the latter order very closely, and differs from that of *Hyracotherium* and the nearest forms among the *Perissodactyla*. *Phenacodus* has moreover five well developed toes on all the feet, and was probably not entirely plantigrade. The cast of the brain case shows that the celebral hemispheres were quite small and nearly smooth, and that the very large cerebellum and olfactory lobes were entirely uncovered by them. The bones of the two carpal rows alternate with each other, and there is a large third trochanter of the femur. The cervical vertebræ are opisthocœlous. The systematic position of the genus may be schematically represented as follows:

Order PERISSODACTYLA; ungulate; digits of unequal lengths; carpal bones alternating; a postglenoid process. Astragalus with proximal trochlea, and without distal double ginglymus.

Suborder *Diplarthra*; astragalus distally plane or concave in one direction, and uniting with both navicular and cuboid bones; a third trochanter of the femur. The known families belong here.

Suborder *Condylarthra;* astragalus convex in all directions distally, only uniting with navicular bone; a third trochanter of femur.

Family *Phenacodontidæ*. Molar teeth tubercular; the premolar teeth different from the molars; five digits on all the feet.

Genera; *Phenacodus* Cope, and very probably *Catathlæus*,[1] *Mioclænus*, and *Protogonia*[2] Cope, and perhaps also *Anisonchus* Cope. These genera include fifteen species, all from the lower Eocene beds. The Condylarthra are then the ancestral type of the known *Perissodactyla*, that is of the horses, tapirs and rhinoceroses, and of the numerous extinct forms.—*E. D. Cope.*

NEW GENUS OF PERISSODACTYLA DIPLARTHRA.—Good specimens of the *Hyracotherium tapirinum* Cope, show that the superior dentition is uninterrupted from the canine inclusive. It thus differs from *Hyracotherium* which has one or two diastemata. The fourth inferior premolar is like the third premolar. The *H. tapirinum* may then be referred to a new genus under the name *Systemodon.*—*E. D. Cope.*

NOTES ON CREODONTA.—A fine series of specimens of *Mesonyx* demonstrates the following points: (1) Pachyæna was founded on a superior molar of *Mesonyx*, and must be suppressed. (2) Apterodon Fischer, is the same as *Mesonyx*. (3) *Mesonyx*

[1] AMERICAN NATURALIST, October, 1880.

[2] Proceedings Amer. Philosoph. Soc., September, 1881.

navajovius Cope[1] must be separated as a distinct genus, since the apices of the crowns of the last two molars have two cusps. This genus may be called *Dissacus*. (4) It results that there are four species of *Mesonyx: M. ossifragus* Cope, *M. lanius* Cope, *M. obtusidens* Cope, and *M. gaudryi* Fisch. *M. ossifragus* was the largest Creodont of the Eocene, equaling the largest grizzly bear in the size of its skull.

The number of possible combinations of tubercular and tubercular-sectorial molar teeth is considerable, and many of them are represented in the genera of the *Creodonta*. A new one must now be added, in a genus which has, in the lower jaw, two tubercular sectorials, and one tubercular posterior to them. The genus thus stands between *Stypolophus* and *Didymictis*, but is nearer the former than the latter, since it has three true molars. It differs further from both in having but three premolars and a wide diastema. The canine is well developed. I call the genus *Lipodectes*, and describe two species, both from the Lowest Eocene, probably Puerco, of New Mexico.

Lipodectes penetrans, sp. nov., represented by a left mandibular ramus with three of the molars preserved. The last has a long heel; the first and second true molars are alike, and resemble those of *Trïisodon*, but the appendicular cusps are better developed. The anterior inner cusp is, however, smaller than the others and is nearly median in position. The heel is elevated on its external border into a strong triangular cusp. The posterior border rises into an acute cusp, which is internal to the middle line. The internal border of the heel is not elevated, and the surface is the oblique inner face of the external cusp. The anterior cusps are only moderately elevated and the cusps are acute. The enamel is smooth, and there is a low cingulum on the external base. The first (second) premolar is two-rooted, and has a large base. The second (third) consists principally of an elevated cusp with a subtriangular section. The heel is very small and acute, and there is no anterior basal tubercle. The internal face is strongly grooved in front. Canines directed upwards, with robust base. Symphysis short. Length of molar series, .043; of premolars, .019; of diastema, .012; length of base of last molar, .010; do of canine, .007; depth of ramus at last molar, .018; of diastema, .015. As large as, but more robust, than the red fox.

Lipodectes pelvidens. This species is about the size of *L. penetrans*, and differs from it in the less carnassial character of the inferior molars. The anterior cusps are relatively smaller in every way, and are more distinctly separated by deeper emarginations. The heel is wider, and has a less elongated external marginal cusp. The inner margin of the heel is elevated, enclosing a basin-like fossa, and rises into a flat cusp posteriorly. There is

[1] Palæontological Bulletin, No. 33, p. 454.

a small median posterior marginal tubercle, which runs into a posterior cingulum, and is wanting from the *L. penetrans*. The tubercular has the three anterior cusps distinct as in *Didymictis* sp., while the heel is longer than in the known species of that genus. Its external border rises into a prominent cusp with triangular base. The fourth premolar has a small heel on the inner posterior side, and an acute anterior basal cusp. The principal cusp is robust and the basal portion is widely grooved posteriorly (apex lost). True molars with an external cingulum. Enamel obsoletely wrinkled. Length of true molar series, .024; of fourth premolar, .0075; length of last molar, .008; width of heel of second true molar, .005; length of crown of do., .007.—*E. D. Cope.*

The Permian Formation of New Mexico.—This formation is richly fossiliferous in New Mexico, and the vertebrates include several of the types already known from Texas and Illinois. Such are, among reptiles, the genera *Diadectes*, *Dimetrodon* and probably *Clepsydrops*. Of batrachians there are two genera, *Eryops*, and what is probably *Zatrachys*. *Diplodus* represents the fishes. All the individuals, and hence, probably, the species, are of smaller size than those of the Texan Permian, resembling in this respect those found in Illinois. Two species of batrachians of the genera above mentioned, are new, and may be described as follows:

Eryops reticulatus.— The most prominent peculiarity of this species is seen in the neural spines, which are not expanded at the summit as in *E. megacephalus*, but have rather contracted apices. Another character is the sharply reticulate sculpture of the maxillary bones. The species is much smaller than the *E. megacephalus*, or even than the *Trimerorhachus insignis*, and the extent of ossification of the vertebral elements is intermediate between the two species. The inferior surfaces of the intercentra are smooth, and the diapophyses are compressed. The occipital condyles are depressed and not very well distinguished inferiorly. The humeri have expanded extremities with enlarged epicondyles and well developed condyles, and no epitrochlear foramen. Width of occipital condyles, m. .016; elevation of dorsal vertebra, .024; width of intercentrum, .011; length of intercentrum (below), .007; five maxillary teeth in .015.

Zatrachys apicalis.—Represented by vertebræ and dermal bones. The summits of the neural spines are expanded, and the superior faces of the expansions are tubercular and have a median prominence. The expansions are sometimes large, resembling the dermal bones of crocodiles, and in that case the median prominence is a keel. On the smaller expansions the latter is a mere apex. There are narrow flat bones which I suppose to be neural spines, which are ornamented with inosculating ridges. A capitular head of a diapophysis is compressed. Intercentra well ossified, those preserved without lateral notch. Inferior surface with

crowded small fossæ, giving a delicate reticulate relief. Length of an intercentrum, .013; width of do., .014; width of the summit of a neural spine, .020; length of do., .014; width of a second do, .025; length of do., 015; width of a third (two unite), .034; length of do., .039. The reference of this species is provisional only. It is much larger than the *Z. serratus.—E. D. Cope.*

NEW CARBONIFEROUS FOSSILS IN SCOTLAND.—In a recent number of *Nature*, Professor Geikie describes a remarkable discovery of fossils in Scotland. The present hoard has been found among that range of hills or uplands familiar to travelers who enter Scotland from the south, which form a barrier between the valleys of the border on the one hand and the Scottish lowlands on the other. This belt of pastoral high grounds has a special interest for the geologist; he can trace it back to its origin about the close of the Silurian period; and since the old red sandstone, notwithstanding submergence, elevation, and denudation, the ridge has continued to form a barrier between the basins on its northern and southern margin. During every part of the carboniferous period these southern uplands of Scotland formed a barrier between the lagoons of the lowlands and the more open waters to the south which spread over the north and centre of England. For some years past the Geological Survey of Scotland, has been engaged in the detailed investigation of the carboniferous rocks between the Silurian uplands and the English border. In the course of the work, one particular zone of shale on the banks of the River Esk, has been found to possess extraordinary palæontological value. From this stratum, where exposed for a few square yards by the edge of the river, a larger number of new organisms has been exhumed by the Survey than has been obtained from the entire carboniferous system of Scotland for years past. As a whole, the remains are in an excellent state of preservation. Indeed, in some instances they have been so admirably wrapped up in their matrix of fine clay as to retain structures which have never before been recognized in a fossile state. The more important treasures from the shales of Eskdale and Liddesdale are fishes, crustaceans, and arachnids. Dr. R. H. Traquair, the eminent palæontologist, in his report on the fossils, points out the extraordinary interest of the collection, both as opening up an almost entirely new fish fauna, and as revealing remarkable peculiarities in the structure of many of the new forms. Out of 28 species of ganoids, no fewer than 20, at least, are new. Of the 16 genera in which these species are comprised, five are now for the first time added to science, of which one (Tarrasius) is altogether so peculiar that no place can be found for it in any known family. The common forms of the Lothians are conspicuous by their absence in Eskdale and Liddesdale. These facts suggest interesting problems in carboniferous geography and in

ancient zoölogical distribution. Associated with the skeletons of the fishes are the remains of some new phyllopod and decapod crustaceans, which have been worked out by Mr. B. N. Peach, the acting palæontologist to the society. One of the most interesting features of this great find, however, is the abundant and often admirably preserved specimens of scorpions, which have enabled Mr. Peach to work out in detail the structure of this interesting creature, doubtless the father of all spiders. In anticipation of the publication of Mr. Peach's descriptions, Professor Geikie gives some notes on the subject. Mr. Peach finds that these palæozoic forms differ in no essential respect from the living scorpion so far as regards external organs. He has recognized in them every structure of the recent form, down even to hairs and hooks on the feet. The sting alone has not been certainly observed, but that it existed may be inferred from the presence of the poison-gland which Mr. Peach has detected in the fossil state. The chief difference between the living scorpion and its ancient progenitors, lies in the fact that in the fossil forms the mesial eyes are much larger in proportion to the lateral ones, and also to the size of the whole animal. The two mesial eyes are placed on an eminence near the anterior margin of the carapace formed by two converging tubes, and so arranged that the creature could look with them upwards, outwards and forwards. There are at least four lateral eyes on each side. The mandibles, palpi and four pairs of walking legs are beautifully distinct on many specimens. The combs are much like those of the modern scorpion, but with a very remarkable sculpturing which at once recalls that so characteristic of the Eurypterids. As regards theories of descent, these fossils afford no more help in tracing the pedigree of the scorpion than is furnished by the living form. There can be little doubt that the scorpion is the most ancient type of arachnid, whence the others have been derived.—*London Times.*

Stegocephali in Saxony.—Fossil remains of several species of *Stegocephali* have been discovered in the neighborhood of Dresden, Germany. Professor Credner, of Leipzic, publishes in the Zeitschrift of the Deutschen Geologischen Gesselschaft for 1881, a first installment of descriptions of the species. This includes the *Branchiosaurus gracilis* Credner, which is represented by several well preserved skeletons. *Branchiosaurus* belongs to the "Microsaurian" subdivision.

Fossil Organisms in Meteorites—Dr. O. Hahn, who will be remembered for the part he took in the "Eozoön" controversy, claims to have established the existence of fossil organisms in sections of meteorites, and his views have been confirmed by Professor Karsten and Dr. D. F. Weinland, the former of whom recognized vegetable forms, while Dr. Hahn was only able to find animal organisms. To enable a better judgment to be formed by

the preparations made by Dr. Hahn, 32 photo-lithographic plates are given of 142 transparent sections. Dr. Weinland estimates that there are fifty various species of polyps, crinoids and algæ in Dr. Hahn's preparations.

"These 'celestial fossils' tell us of a planet on which aquatic life was sufficiently developed to produce them and to preserve them after death by a process of infiltration with siliceous material which dissolved the lime of which their structure must have consisted, as far as their inorganic constituents are concerned, and supplanted it by the various kinds of siliceous materials, filling up also the interstices and openings which had formerly contained organic substance. This planet, therefore, must have had a comparatively long period of existence; it must have had an atmosphere, and its surface must in whole or in part have been covered by water. Since bacteria are known to be able to withstand a temperature of 100° C., without losing vitality, the Thomson-Richter hypothesis of the propagation of life through the universe becomes almost a tangible reality."

It is nevertheless extremely probable that Dr. Hahn and friends have been deceived, and a great deal more evidence will be required by biologists before crediting these alleged discoveries. —*Eds.*

Geological News.—Professor J. W. Dawson has had a fine series of photographs executed which represent the *Batrachia* of the Coal measures of Nova Scotia, some of them new species. One of the latter is referred to a new genus, *Fritschia*.——In the Bulletin of the U. S. Geological Survey of the Territories, Professor A. S. Packard, Jr., discusses the extinct craw-fishes.——In the same, Professor Cope reviews the osteology of the *Rodentia* of the Miocene period of North America.——In this Bulletin also, the same author describes some of the *Canidæ* of the Loup Fork formation. He shows that the genus *Ælurodon* belongs to that family, and describes the *Æ. hyænoides* as new. *Canis brachypus* is a new species from the Ticholeptus beds.——At the late meeting of the British Association for the Advancement of Science, Dr. H. G. Seeley described the characteristics of the Plesiosauroid genus *Simosaurus*. He finds that while the anterior feet are adapted for swimming, as in *Plesiosaurus*, the posterior ones are adapted for progression on land, having curved claws. He thinks that the genus represents a transition between terrestrial and aquatic types, and that the origin of *Plesiosaurus* from a land reptile is thus clearly indicated. This reminds us of the *Neustosaurus gigondarum* of Raspail, described in 1842, which was said to have a similar structure, and which, Professor Bronn remarked in Lethæa Geognostica, "ist nicht zu glauben ohne zu sehen!"

GEOGRAPHY AND TRAVELS.[1]

PROCEEDINGS OF THE GEOGRAPHICAL SECTION OF THE BRITISH ASSOCIATION.—The fifty-first meeting of the British Association for the Advancement of Science, held at York from the 31st of August to the 7th of September, was chiefly occupied in reviewing the progress of science in the various departments during the fifty years of the society's existence. The address of the president of the geographical section, Sir J. D. Hooker was devoted to the growth of our knowledge of the Geographical Distribution of Organic Beings. He briefly alluded to the unprecedently great advance made in the last fifty years in our knowledge of the unknown regions of the earth.

"The veil has been withdrawn from the sources of the Nile and the lake systems of Central Africa have been approximately localized and outlined. Australia, never previously traversed, has been crossed and recrossed in various directions. New Guinea has had its coasts surveyed, and its previously utterly unknown interior has been here and there visited. The topography of Western China and Central Asia, which had been sealed books since the days of Marco Polo, has been explored in many quarters. The elevations of the highest mountains of both hemispheres have been accurately determined, and themselves ascended to heights never before attained; and the upper regions of the air have been ballooned to the extreme limits beyond which the life-sustaining organs of the human frame can no longer perform their functions. In hydrography the depths of the great oceans have been sounded, their shores mapped, and their physical and natural history explored from the equator to beyond both polar circles. In the Arctic regions the highest hitherto attained latitudes have been reached; Greenland has been proved to be an island; and an archipelago has been discovered nearer to the Pole than any other land. In the Antarctic regions a new continent has been added to our maps, crowned with one of the loftiest known volcanoes, and the Antarctic Ocean has been twice traversed to the 79th parallel. Nor have some of the negative results of modern exploration been less important for the Mountains of the Moon and many lesser chains have been expunged from our maps, and there are no longer believers in the inland sea of Australia or in the open ocean of the Arctic pole."

A paper was read by Sir Richard Temple, On the Progress of our geographical knowledge of Asia during the last fifty years. "The area of Asia contains seventeen millions of English square miles. Out of this about two-thirds consists of mountains and table-lands whereof a large part is desert; and one-third of lowlands, wherein a small part is desert; the rest of the lowlands being arable, of which again a considerable portion is cultivated. Thus out of the whole area not more than one-sixth is under

[1] Edited by ELLIS H. YARNALL, Philadelphia.

cultivation; among the populated tracts, however, some are the most densely peopled in the world."

"In the midst of the continent is a great central plateau, more than two millions of English square miles in area, rising to great altitudes, which dominates the river systems and the drainage of the greater part of Asia and which is bounded by the Himalayas towards the Indian Ocean, by the Yun-ling and the Inshan Mountains towards the Pacific Ocean, by the Altai and Yablonoi ranges towards the Arctic Ocean, and by the Pamir Mountains towards the inland seas, the Aral and the Caspian. The Pamir Mountains constitute a group connecting the great ranges of Himalaya and Altai. Branching off from this central plateau is another extensive plateau with an average altitude of 5000 feet above the sea, which includes Afghanistan, Beluchistan, Persia, Armenia, and Asia Minor, and from a small part of which the drainage is towards the Atlantic Ocean through the Black Sea and the Mediterranean. It is through Asia Minor and the Caucasus that the Asiatic Mountains are connected with the ranges of southern Europe. It is remarkable that from within this central plateau, walled round as it is by mountain ranges, there rise most of the greatest Asiatic rivers which burst through the mountains in order to make a passage towards the sea. Such, for instance, are the Indus with its affluent the Satlej, the Brahmaputra, the Ganges, the Irawady, the Salwen, the Cambodia or Mekong, flowing into the Indian Ocean; the Yang-tsze Kiang, the Hoang-Ho, the Amur, flowing into the Pacific Ocean; the Lena, the Yenisei, and the Ob flowing into the Arctic Ocean; the Jaxartes and the Oxus flowing into the inland sea of Aral. Many other rivers which though lesser are still very great, take their sources from the outer slopes of the mountains which surround the central plateau.

Next after the oceanic drainage, the inland Asiatic drainage, which finds no vent towards the ocean, may claim attention as being the largest in the world, and as occupying nearly four millions of English square miles or nearly one-fourth of the Asiatic continent. This extraordinary drainage area may be divided into the following categories:—1st, the Caspian; 2d, the Aral; 3d, the Balkash [Siberian]; 4th, Lake Lob [Yarkand]; 5th, Koko-Nor; 6th, the lesser lake of Tibet; 7th, the lesser lakes of Altai; 8th, the Helmand draining nearly all Afghanistan into the Seistan swamps; 9th, the Kavir or saline deserts in Eastern Persia; 10th, the lake of Urumiya in Northwestern Persia; 11th, Lake Van in Kurdistan; 12th, the Dead Sea.

The central plateau is made up of several plateaux having different altitudes. The highest is that of Tibet, on the average 15,000 feet above the sea, the loftiest in the world; next, that of Pamir, 13,000 feet; then that of Koko-Nor, 10,000 feet. Next we see a sudden dip or depression, namely, that of Yarkand or

Western Gobi, only 3000 feet above the sea; then there follow two steps upwards, namely, that of Eastern Gobi, 4000 feet; and lastly that of Altai, 5000 feet.

The central plateau has been the home of most of the nomad and pastoral tribes which have successfully overrun the rest of Asia. It now belongs [with the exception of one tract] to the Chinese empire.

Dividing the continent into eight political divisions Sir Richard Temple gives a condensed, but satisfactory review of the work accomplished in them since 1830, and mention is made of all the principal explorers and writers. In conclusion he says, "The greater part of Asia has not yet been touched by scientific operations on a complete scale. In the whole of Asia only India, Ceylon, Cyprus, Western Palestine, Caucasia, the Caspian basin, part of Western Siberia, and part of Japan, also many points in the Asiatic coastline, have been subjected to trigonometrical observation. The altitudes of mountains have been determined only in the Himalayas, the Caucasus and the Urals by trigonometry. But in many ranges the heights have been approximately ascertained by the barometer. Professional surveys in detail have been completed only in India, Ceylon, Western Palestine, Caucasia, parts of Western and Eastern Siberia, the Tian-Shan region, the greater part of Western Turkistan, Cambodia, parts of Cochin China, parts of Afghanistan, also on certain lines of Persia, Mesopotamia, and Asia Minor.

Even in the professionally surveyed territories many defects and imperfections are acknowledged to remain. Non-professional surveys have been carried out in Japan, in China proper, in parts of Arabia, on the frontiers of Tibet, China, and Burma, and on certain lines in Afghanistan and Beluchistan."

"Of geological surveys, the largest example is that in India which, though far advanced, is far from complete. Very much remains to be done in this respect for the Himalayas. Geological surveys have been made in the Caucasus, the Urals, the Tian-Shan and Altai ranges, Kamchatka, many parts of China and Japan, Cambodia, Ceylon, some parts of Arabia and Persia, much of Asia Minor and Palestine. But there remain unexplored, parts of the Himalayas, of Afghanistan and Beluchistan, of Arabia, nearly the whole Kuen-Lun region north of Tibet in the very heart of Asia.

Further the following are among the principal geographical problems still awaiting solution:—The connection of the Tibetan San-po with the Indian Brahmaputra; the existence of mountains connecting the Kuen-Lun range eastwards with the Chinese ranges; the sources and upper courses of the Irawady, Salwen, Mekong and Hoang-Ho, the disposition of the mountains between the Ladakh passes and the Hindu-Kush or Indian Causasus north of Caubul, near to the culminating region of the entire continent."

Papers were read as follows: The equipment of exploring expeditions now and fifty years ago, by Francis Galton, F. R. S.; On the survey of Western Palestine, by the Palestine Exploration Fund, by Trelawny Saunders; A review of Oceanic or Maritime discovery, exploration and research, during the half-century, 1831–81, by Captain Sir Frederick Evans, R. N., F. R. S., Hydrographer of the Admiralty.

HUDSON'S BAY.—Dr. Robert Bell, Assistant Director of the Geological Survey of Canada, recently read before the Royal Geographical Society a paper on the Commercial Importance of Hudson's Bay. He gave an interesting account of that great North American sea. "In the popular mind Hudson's Bay is apt to be associated with the polar regions, yet no part of it comes within the Arctic circle, and the southern extremity is south of the latitude of London. Few people have any adequate conception of the extent of this great American sea. Including its southern prolongation, James' Bay, it measures about 1000 miles in length and it is more than 600 miles in width at its northern part. Its total area is approximately 500,000 square miles, or upwards of half that of the Mediterranean Sea of the old world. It is enclosed by the land on all sides except the northeast, where it communicates by several channels with the outer ocean. The principal or best known of these is Hudson's Strait, which is about 500 miles in length, and has an average width of about 100 miles.

"Hudson's Bay, which might have been more appropriately called Hudson's Sea, is the central basin of the drainage of North America. The limits of this basin extend to the centre of the Labrador peninsula, or some 500 miles inland on the east side and to the Rocky Mountains, or a distance of 1300 miles on the west. The Winnipeg Basin constitutes a sort of outlier of the region more immediately under notice, since the waters drain into it from north, south, east and west, and discharge themselves by one great trunk—the Nelson river—into Hudson's Bay. The southernmost portion of this basin, namely, the source of the Red River, extends down nearly to latitude 45°. The headwaters of the southern rivers of James' Bay are not far to the north of Lake Huron; while one of the branches of the Albany rises within 25 miles of the north shore of Lake Superior. Including the Winnipeg system, the basin of Hudson's Bay has a width of about 2100 miles from east to west, and a length of about 1500 miles from north to south, and its dimensions approach the enormous area of 3,000,000 square miles." * * * "Both the bay and strait are remarkably free from rock and shoals which might interfere with their free navigation."

Churchill Harbor on the west side can be entered by vessels of the largest size, and is thought likely to be the future shipping port for the agricultural and mineral products of the vast Northwest Territory. The shortest route between this territory and

England is through Hudson's Bay. Even the city of Winnipeg, near the southeastern extremity, is at least 800 miles nearer to Liverpool by the Hudson's Bay route than by the St. Lawrence.

As regards the difficulties caused by ice, Dr. Bell believes that the strait and bay may be navigated and the land approached by steamer during an average of four and a-half months each year, or from the middle of June to the end of October. The bay itself and probably the straits are open all the year round—it is only the harbors that are closed.

MICROSCOPY.[1]

AMERICAN SOCIETY OF MICROSCOPISTS.—The executive committee of this society has decided to accept the invitation of the Elmira Microscopical Society, and to convene the next annual meeting of the society at that city, Elmira, N. Y., on Tuesday, Aug. 17, 1882, at 10 A. M. It is expected that the meetings will occupy four days, the final adjournment occurring Friday evening or Saturday morning, leaving ample time for those who wish to attend the Montreal meeting of the A. A. A. S. to reach Montreal by Tuesday, Aug. 24th. Many important papers have already been promised, and there is every reason to believe that the attendance will be large and the proceedings important. The local society at Elmira has taken up the work of preparing for the reception and entertainment of the society, with great enthusiasm, and will doubtless carry it out with marked success.

The committee appointed to consider and report upon the possibility of securing greater uniformity in the sizes of oculars produced by different makers, and some definite and uniform nomenclature in regard to their amplifying powers, has issued a circular to all manufacturers in this country asking information and co-operation. In the interest of the future convenience and satisfaction of all parties concerned, it is hoped that makers and dealers will cordially unite with the society in attempting by all reasonable means to secure so desirable an object. Those makers who may have failed to receive the circular can obtain copies from any member of the committee which consists of the following Ex-Presidents and present President of the Society: R. H. Ward, Troy, N. Y., H. L. Smith, Geneva, N. Y., J. D. Hyatt, Morrisana, N. Y., Geo. E. Blackham, Dunkirk, N. Y.

The Griffith prize, consisting of a Bausch and Lomb ½ inch objective of 98° air angle (0.76 numerical aperture) is to be awarded at this meeting to the author of the best paper presented on the adulteration of some important article of food or medicine. Papers are to be accompanied by permanently mounted slides illustrating the points under discussion. Names of competitors are to remain unknown until after the announcement of the

[1] This department is edited by Dr. R. H. WARD, Troy, N. Y.

award. Persons intending to become members of the Society at the coming meeting can compete on the same terms as present members. Circulars giving particulars as to the required method of competition can be obtained from the Secretary, Professor D. S. Kellicott, Buffalo, N. Y.

VERIFICATION OF OBJECTIVES.—The editor of the *Northern Microscopist* (Manchester, England), announces the opening of a verification department, in which it is proposed to publish, for a fee of eighteen pence to cover expenses, information in regard to any objective sent for examination. The following measurements will be given:—focal length and angular aperture as estimated by maker; linear amplifying power, working focal distance, and absolute size of field, at ten inches from front lens of objective to plane surface of eye-lens of ocular (which is a Ross A, with diaphragm aperture of 0.75 inch, and approximate magnifying power of 5 diameters); numerical aperture by Professor Abbe's apertometer, and calculated equivalent air angle. Though not likely to work without some friction, this department will, if permanently successful, be a great convenience to those owners or intended purchasers of lenses, who have not the experience or apparatus requisite to test them for themselves. It would be still more satisfactory, and would probably conduce to the increased success of such as might adopt the plan, if makers and dealers would have their lenses similarly examined and certified to by competent and impartial authority, before offering them for sale.

MOUNTING ON SQUARE SLIPS.—Mr. J. Fenner proposes, in the *English Mechanic*, to mount microscope objects on glass one inch square instead of the standard 3x1 slips. These are to be placed in shallow circular paper boxes, just large enough to contain them, which may be obtained cheaply in large quantities at the wholesale drug stores. The slide is to be covered with a cardboard diaphragm snugly fitted into the box, perforated by a central opening through which to view the object, and covered with a gummed label. The bottom of the box has a central opening (previously punched through it) for the transmission of light; and the cover is labeled and numbered to correspond with the box and with the owner's register-book. As none of the slide is visible except the central portion immediately around the object, great skill or care is not required in giving an elegant finish to the cell or to the outline of the mounting medium. Such mounts, which can be easily and satisfactorily prepared by inexpert persons, have no top or bottom edge, but can be placed on the stage in any position, and rotated by the hand. They are evidently not suitable for delicate work or for use with high powers.

MICROSCOPIC TEST FOR POISON.—To test fluids for such minute quantities of certain alkaloids as would not answer to chemical

procedure, Professor Rossbach places, uncovered, on a slide, a drop of water containing Infusoria, to which, being carefully examined, a little of the suspected fluid is applied. If organic poison be present the Infusoria become a formless sediment. 1–15,000,000 of a grain of atropine may be thus detected.—*Science Gossip.*

SLIDES OF MARINE ALGÆ.—Rev. A. B. Hervey of Taunton, Mass., will mail to any address, for two dollars, a set of six slides showing the characteristic fruit of the six great groups into which Professor Agardh divides the Red Algæ.

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SCIENTIFIC NEWS.

— A number of final reports of the Norwegian North Atlantic Expedition have recently appeared. It has been found, says the New York *Nation*, that free carbonic acid does not exist in ordinary sea-water, which indeed has an alkaline reaction, but that it is present in the form of carbonates, and in a less degree of bicarbonates. In regard to saltness, a remarkable fact was determined, which has a most important bearing on various theories of oceanic circulation—namely, that the excess of salt noticeable and expected in the warm Atlantic current water was not confined to it, but almost equally characterized the deep strata, which were reduced to the freezing point. This water is, therefore, not a Polar indraught, as has been supposed, Arctic or Antarctic, but is tropical surface water, which has been cooled; while the Polar water continues equally distinguished from it by its deficient saltness, and appears to allow the cooled salt water of the surface to sink through it without mixing, and to form on the bottom certain portions of what has been called the "cold area."

Six or seven new species of fishes, a ray, a sucking pout (*Liparis*), several species of Lycodes, were discovered, together with a translucent "ghost," with ventral fins reduced to long biped filaments attached to the throat, and with no scales, which was called *Rhodichthys regina*. It was brought up from a depth of a mile and a half in the open sea between Jan Mayen and Finmark.

— The Fourth Annual Book of the Michigan Sportsmen's Association is an interesting document. This is one of the most useful of such societies, and is doing a good work in cultivating the proper tone in regard to the preservation of game, a matter in which every naturalist is interested. How important the subject is, may be seen upon reading the article by Prof. Roney on the destruction of deer in 1880, and the necessity of prohibitory export laws. It appears that in 1877, in two months, 15,000 deer were killed in Michigan, of which, at least, 8,500 were exported from the State. In 1878, a grand total of 1,600,000 pounds of venison, or about 21,000 deer were slaughtered, of which 13,500

were killed by still hunters, 3,000 of these being killed for the hides alone, and the balance shipped out of the State to Eastern, Southern and Western markets. In 1880, the destruction of deer was greater than ever before in the history of the State, 10,000 deer being shipped from fifteen stations alone, and the total number of deer killed being 70,000, or about 10,000,000 pounds of venison. This shocking destruction of deer is paralleled by the wanton destruction of game farther west. Organized societies, which demand and create proper legislation to prevent this evil, are doing a great work for civilization.

— Prof. S. A. Forbes has spent the last two months exploring, with sounding line, dredges and beam trawl, the small lakes of Northeastern Illinois, Geneva lake in Wisconsin and some parts of Lake Michigan, viz.: the southwest part, off Chicago, from the shore to seven miles out, and the regions of Grand Traverse bay in Michigan. In the latter he dredged and hauled the trawl in 105 fathoms. He also used the towing net everywhere, with very interesting results. The most important collections made are those of mollusks, deep-water crustaceans, entomostracans and Cottoid fishes. The species collected in Lake Michigan by Stimpson and Miller, and afterwards lost in the Chicago fire, were obtained in abundance, and some were found not reported by previous collectors. The greatest novelties occur among the entomostraca.

The beam trawl was found admirably adapted to the collection of Cottoids, but few other fishes were taken by it. In the smaller lakes it took nothing not obtainable by the use of the dredge.

Full notes were kept of the vertical range of plant and animal life, and of the relative abundance of species at various depths. The results will be reported in detail in the bulletins of the Illinois State Laboratory of Natural History.

— The bread distributed on a recent occasion to a cavalry detachment in a garrison at Oran, in Algeria, was moldy, covered with dark and orange cryptogamic vegetation, though made only 48 hours previously. The men refused to eat it, and mostly threw it away; but some offered it to their horses, who scarcely touched it, with exception of two, which ate each about half a kilogramme. The consequence was a true poisoning, not followed by death, but seriously injuring one of the horses. (Such poisoning of animals has been known to occur before.) M. Megnin was led to study the substances developed on the bread, and he found there were two kinds of mold, one *Ascophora nigricans* forming a flaky cover of sooty-color; the other, *Oidium aurantiacum*, forming spots of salmon-color, and with great power of multiplication. M. Megnin believes the sporules of these molds existed in the flour before the bread was made. He cultivated the molds specially and experimented on dogs with them. The sickness and vomiting were much more violent with the *Ascophora nigricans*, but the other had considerable action.

— Dr. Chavanne has published a hypsometrical map of Africa, and has calculated, from 8000 hypsometrical measurements, the average height of the whole continent, which he finds to be no less than 661.8 metres (with a probable error of ± metres). This very high figure obviously, says *Nature*, is the result of the very great extension of high plateaux, which we do not find to such an extent even in Asia.

— The glacier of Zerafshan, which is sixteen miles long, has been explored throughout its whole length; it has thirteen secondary glaciers. The Ala-taon mountains, in Asia, are also covered with mighty glaciers; these mountains are from 10,000 to 16,000 feet high.

— Texas is to have a State university. The governor has called the regents to meet at Austin to make a permanent organization preparatory to the establishment of the university.

— Dr. Gustaf Linnarson, the well-known palæontologist of the Swedish Geological Survey, died in September last at the age of 40 years.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

NATIONAL ACADEMY OF SCIENCES.—Titles of papers read at Philadelphia meeting, commencing November 15, 1881:

On a gigantic Salpa found in the Gulf Stream. By Professor A. Agassiz.
The Echini of the Challenger Expedition. By Professor A. Agassiz.
The Classification of the Dinosauria. By Professor O. C. Marsh.
Succession in time of the Allotheria. By Professor O. C. Marsh.
Distribution of the Corals of Tortugas. Professor A. Agassiz
The Porpitidæ and Velellidæ of the Gulf Stream. By Professor A. Agassiz.
Complex Organic Acids. By Professor W. Gibbs.
The theory of Dynamo-Electric Machines. By Professor W. Gibbs.
The Phenacodontidæ, a new group of Perissodactyla. By Professor E. D. Cope.

Second day, Nov. 16:

A comparison between the shells of the Kjockkmödings of the coast of New England and the present shells of the same species. By Professor E. S. Morse.
The expedition to Mount Whitney, with observations on solar energy. By Professor S. B. Langley.
A peculiar vein containing gold and silver found in the Sierra Negretta or Black range. By Professor B. Silliman.
On the Life and Labors of Professor S. S. Haldemann. By Professor J. P. Lesley.
Logic of Numbers. By Professor Charles Pierce.
Chinoline Synthesis for Medical Uses. By Professor Henry Morton.
Hydrometer Scales. By Professor C. F. Chandler.
The Velocity of Light. By Professor Simon Newcomb.

Third day, Nov. 18:

Sorghum and some conclusions as to its value as a source of sugar. Read by invitation by Peter Collier.
Maschart's Electrometer and its use as a meteorological instrument. By Professor Geo. F. Barker.
The Fossil and recent Faunæ of the Oregon and Idaho deserts in relation to the antiquity of man. By Professor E. D. Cope.

PROCEEDINGS OF THE AMERICAN PHILOSOPHICAL SOCIETY, March 18, 1881.—A memoir On the Preglacial drainage of Lake Erie and other great lakes, by Dr. J. W. Spencer, was read and illustrated by the secretary. A paper on a geological section at St. Marys, in Elk county, Pa., was read by Mr. Ashburner.

April 1.—Prof. W. M. Fontaine offered for publication in the Transactions of the Society, a memoir on the Rhætic flora and the formation to which they belong, in Virginia and North Carolina. Mr. Mansfield, of Connelton, Beaver county, Pa., communicated by letter a drawing, life size, of a fine fossil, *Eurypterus*, found by him in the shale immediately beneath the Darlington cannel beds, lower productive coal measures. Mr. E. B. Harden presented two models in plaster, one geologically colored, the other uncolored, of a large portion of Blair county, Pa., on a scale of 8000′ 1″, vertical scale exaggerated two and a-half times. Captain E. Y. McCauley, U.S.N., communicated for publication in the Proceedings, An alphabet and syllabary of the Egyptian language for the use of students.

April 15.—A drawing and a description of his improved "Centigrad Photometer," was received from D. Coglievina of Vienna. Professor P. E. Chase explained certain relations of the spectrum line F with other lines and data, suggesting the probable identity of hydrogen and the luminiferous æther. Professor E. D. Cope read a paper on the classification of the Perissodactyla. Dr. König made remarks on Dr. P. F. Reinsch's plates of the microscopic lithology of the Anthracite and other coals. Mr. Lesley communicated an appendix to Dr. Spencer's paper on the Lake Erie former water-basin, suggesting the probable course of the upper Ohio from Pittsburgh to Butler, thence via New Castle, up the present Mahoning valley, and down the grand valley of the Ohio to Lake Erie.

May 6.—Mr. Frazer exhibited coins, also specimens of granite, cement, lead, bronze and steel, used by the Egyptians in erecting the obelisk, now in New York, and sections of the granite under the microscope. Mr. Ashburner exhibited a suite of maps of one of the British coal fields. Dr. Chance communicated a paper, entitled "An analysis of the fire damp explosions in the Anthracite coal mines from 1876 to 1880."

June 17.—Communications were made as follows, viz.: 1. Note on the Geology of West Virginia, by J. C. White. 2. A Series of Standard Units, by Pliny E. Chase. 3. On Alaska, by Prof. George A. König.

July 15.—The following communications were read: 1. On the Argilliferous Gravels of North Carolina, by H. M. Chance, M. D. 2. The Brain of the Cat, *Felis domesticus*, with four plates, by Burt G. Wilder, Prof. Anatomy in Cornell University. 3. The Vagus Nerve of the Cat, with four plates, by T. B. Stowell.

September 17.—Professor Cope communicated a paper, entitled "On Some Mammalia of the Lowest Eocene of New Mexico."

October 7.—Professor J. J. Stevenson communicated through the Secretary as follows: "Notes on the Coal-field near Cañon City, Colorado. Notes on the Quinnimont coal group in Mercer Co., W. Va., and Tazewell Co., Va. By John J. Stevenson, Professor of Geology in the University of the City of New York. Professor Cope exhibited a very perfect lower jaw of a marsupialoid type with carnivorous characters from New Mexico. On splitting the jaw he found beneath a genuine and perfect marsupial fourth premolar, a concealed perfect successional tooth of carnivorous type. In front of it was another and smaller concealed successional tooth of the same type. He named the animal *Triïsodon quivirensis.* Professor Cope exhibited, also, a tooth of an animal from the Lower Eocene of New Mexico, the importance of which lay in the fact that proved the continued existence of the Jurassic (Purbeck) *Plagiaulax* type through the Cretaceous to Tertiary times. He names the Lower Eocene form *Ptilodus mediævus.*

October 21.—Professor Haupt exhibited specimens of natural terra cotta produced by spontaneous combustion in the lignite of the Badlands, and used for ballasting the Northern Pacific R. R. Mr. Lesley exhibited a recent completed map of the Bald Eagle mountain and Birmingham hills in Blair and Huntingdon counties, Pa., drawn by E. B. & O. B. Harden, for the purpose of explaining the difficult structure of the Sinking Valley faulted anticlinal, &c. Mr. Lesley read "Notes on a possible Adite element in the early history of Egypt."

Middlesex Institute, Mass., Sept. 7.—A free public exhibition of native autumn flowers was given. Among the novelties shown was *Solidago bicolor, var. concolor* from Malden, collected by Henry L. Moody, who was also fortunate enough to find, *just over the county line* and in Essex county, *Pedicularis lanceolata* Michx., a most interesting discovery for this region. Mr. Frohock exhibited *Echium vulgare* from Summerville. The collection of Asters and golden rods was particularly fine, considering the unfortunately hot weather prevailing at the time, and the whole exhibition creditable to the Institute and to the ladies who contributed so much towards its success.

Sept. 14.—Mr. Davenport read a paper on "Some Internal Visual Phenomena," which was followed by a most interesting discussion in which Messrs. Moody, Gleason, Dame, Frohock, Collins and others participated.

Boston Society of Natural History, October 19.—Prof. A. Hyatt discussed the formation through disease of movable joints in lobster claws; Mr. N. F. Merrill read a paper on the Lithological Collection of the Survey of the Fortieth Parallel, and Dr. M. E. Wadsworth gave some items relating to the Geology of Eastern Massachusetts.

November 2.—Mr. W. O. Crosby discussed the Classification of the textures and structures of rocks; Dr. M. E. Wadsworth spoke of the Trachyte of Marblehead Neck; and Mr. William Trelease described the Nectar-glands in the peduncle of the Cow-pea.

APPALACHIAN MOUNTAIN CLUB, October 12.—Mr. W. H. Pickering spoke of a trip made this summer over Passaconaway and Whiteface, and Prof. C. E. Fay spoke of the discovery of a natural camp in King's Ravine. Other informal reports of summer excursions were made, and on the 15th, the Club made an autumn excursion, visiting the Uncanoonucs, near Manchester, N. H.

Nov. 9.—The Councillors presented their reports of work done during the summer. Mr. F. W. Parker spoke of a recent trip through the region north of Moosehead lake, and Mrs. R. A. Bradford read a paper entitled, "A sketch of the ascents of Bald and Berlin mountains."

NEW YORK ACADEMY OF SCIENCES, October 17.—The following papers were read: Geological facts recently observed in Idaho, Utah, Nevada and Colorado, by J. S. Newberry. Outlines of the geology of the Northeastern West India islands, by Professor P. T. Cleve (of Sweden).

Oct. 24.—Notes on the physiology of vision, with modifications in the ordinary theory of the stereoscope, were read by Mr. W. Le Conte Stevens.

Oct. 31.—The following paper was read: The Geology of the Copper region of Northern Texas and the Indian Territory, by John H. Furman.

CALIFORNIA ACADEMY OF SCIENCES, Nov. 4.—Hon. B. B. Redding, president of the board of trustees, announced the very generous and welcome donation of $20,000 to the Academy by Charles Crocker. Charles Wolcott Brooks, secretary of the board, then read the following letter of presentation, and the acknowledgment forwarded to Mr. Crocker by the trustees:

SAN FRANCISCO, NOVEMBER 1, 1881.

To the Trustees of the California Academy of Sciences, San Francisco, Cal.—Gentlemen: Desiring to make an acknowledgment of my appreciation of the benefits conferred upon society through the labors of students and investigators in those branches of science that are popularly supposed not to be practically profitable, I herewith send you $20,000 in Southern Pacific Railroad bonds.

The income from said fund of $20,000 I desire you shall annually expend in assisting in their investigations in California, Oregon, Nevada and Arizona, such worthy and studious investigators, in any branch of science, as have, by their devotion to scientific investigations and experiments, largely and necessarily excluded

themselves from acquiring support through the ordinary avocations of current industrial life. Very respectfully,

CHARLES CROCKER.

TORONTO NATURAL HISTORY SOCIETY, Nov. 7.—Henry Montgomery, the president, gave a lengthy address upon "The Relations of the Blastoidea," copiously illustrated by specimens of existing and extinct sea-urchins of various genera, star-fishes, brittle-stars, crinoids, trepangs and Blastoidea of the genera *Pentremites* and *Nucleocrinus*. Of the last-named genus the lecturer exhibited the specimen recently described by him in his paper on "A Blastoid found in the Devonian rocks of Ontario." Mr. William Brodie then showed specimens of fiber from the upper sheaths of the "broom" grass, *Adropogon scoparius*, well adapted for the manufacture of cordage and paper. In his address Mr. Brodie claimed that this grass can be utilized to reclaim dry, sandy, waste land. The samples shown were remarkably tenacious.

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SELECTED ARTICLES IN SCIENTIFIC SERIALS.

AMERICAN JOURNAL OF SCIENCE, November.—Jurassic birds and their allies, by O. C. Marsh. Local subsidence produced by an ice-sheet, by J. W. McGee. Note on the Laramie group of Southern New Mexico, by J. J. Stevenson. The nature of Cyathophycus, by C. D. Walcott.

THE GEOLOGICAL MAGAZINE, October.—On some points in the morphology of the Rhabdophora, by J. Hopkinson. The glaciation of the Shetlands, by D. M. Home. Differences between the London and Berlin Archæopteryx, by H. G. Seeley.

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THE SIXTEENTH VOLUME OF THE AMERICAN NATURALIST.—Although no promises of enlargement were made to our subscribers at the beginning of the year, we beg to call attention to the fact that Vol. XV contains 1042 pages, or 116 pages more than the preceding volume. The number and variety of illustrations is also greater than in the last volume.

We can assure our readers that from the papers now in hand and those promised, Vol. XVI will certainly not be inferior in variety and interest to any of its predecessors. There is considerable probability that a department of mineralogy will be shortly added.

We would respectfully invite the contributions of original notes and articles, and items of scientific news, and would ask our friends to call the attention of those in any way interested in natural history to our magazine, as an aid and stimulus in their studies and field work. We want to so enlarge our subscription list, that we can offer more illustrations to our patrons.

We would respectfully ask our exchanges to specially notice the December NATURALIST, and to send marked copies containing such notices to the editors.

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ERRATUM.—On p. 943, the line,

"Those matted woods, where birds begin to sing,"

should read,

"Those matted woods, where birds *forget* to sing."